A Dissertation on

A STUDY OF 100 CASES OF PANCYTOPENIA : A CLINICO-HEMATOLOGICAL CORRELATION

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CERTIFICATE-I

Certified that this is the bonafide dissertation done by ***Dr. M.MOHAMED FAIZAL BASHEER*** *and submitted in partial fulfillment of the requirements for the Degree of* ***M.D., General Medicine****, Branch I of* ***The Tamilnadu Dr. M.G.R. Medical University, Chennai.***

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DECLARATION

I Solemnly declare that the dissertation titled "**A STUDY OF 100 CASES OF PANCYTOPENIA: A CLINICO-HEMATOLOGICAL CORRELATION"** was done by me from JULY 2017 to JUNE 2018 under the guidance and supervision of **PROF. Dr K.SWAMINATHAN M.D.**

This dissertation is submitted to **The Tamilnadu Dr.M.G.R. Medical University** towards the partial fulfilment of the requirement for the award of MD degree in General Medicine (Branch 1)

Place: Coimbatore

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Lastly, I am ever grateful to the **ALMIGHTY GOD** for always showering His blessings on me and my family

DR. M.MOHAMED FAIZAL BASHEER

CERTIFICATE – II

This is to certify that this dissertation work titled "**A STUDY OF 100 CASES OF PANCYTOPENIA : A CLINICO-HEMATOLOGICAL CORRELATION"** of the candidate DR.M.MOHAMED FAIZAL BASHEER with registration Number- 201611309 for the award of M.D in the branch of General Medicine I personally verified the urkund.com website for the purpose of plagiarism Check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **4% (FOUR**) percentage of plagiarism in the dissertation.

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Dissertation Topic : A clinico-hematological correlation study in pancytopenia

The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation Proposal is accepted and you are permitted to proceed with the above Study.

24.12.16

Member Secretary
Ethics Committee

TABLE OF CONTENTS

LIST OF ABBREVIATIONS USED

- HB –Hemoglobin in grams
- PLT-platelet count in cubic mm
- TLC –Total leucocyte count in cubic.mm
- AA–Aplastic anemia
- HIV – Human immunodeficiency virus
- EBV – Ebstein barr virus
- WHO - World Health Organisation
- ESR – Erythrocyte sedimentation rate- mm in 1 hour
- MCV – Mean corpuscular volume
- RFT – Renal function test
- LFT – Liver function test
- ECG-Electrocardiogram
- BMA- Bone marrow aspiration
- SLE- Systemic lupus erythrematosus
- TB – Tuberculosis
- CD – Cluster of differentiation
- MDS – Myelodysplastic syndrome
- HCL – Hairy cell leukemia
- LDH – Lactate dehydrogenase
- CLD – CHRONIC LIVER DISEASE
- ALL – Acute lymphoblastic leukemia
- AML – Acute promyelocytic leukemia

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INTRODUCTION

Pancytopenia is the simultaneous occurrence of anaemia, leucopenia, thrombocytopenia and it is a not a disease but rather a clinico-hematological entity encountered in clinical practice. Pancytopenia is a feature of many serious and life threatening diseases. It is generally due to decrease in hematopoietic production in bone marrow resulting from nutritional deficiencies, infections, inflammation, cancers, chemotherapeutic drugs and other toxins. Different studies conducted at different centres showed varying frequencies of diseases producing pancytopenia. Hence identification of disease process producing pancytopenia is of prime importance, since it is the key to appropriate management.

Patients with pancytopenia presents with varied clinical manifestation. Patients presenting with pancytopenia are going to be evaluated by this study using clinical features and haematological parameters like complete blood count,pheripheral smear,bone marrow aspiration study to arrive at a appropriate diagnosis. Marrow cellularity and morphology in cases of pancytopenia varies in relation to the underlying pathology.

Present study has been undertaken to evaluate the etiology, clinical profile, haematological profile and bone marrow morphology of pancytopenia. There by, this data would be helpful in planning the diagnostic and therapeutic approach in patients presenting with pancytopenia.

OBJECTIVES OF OUR STUDY

1) To study the various patterns of clinical presentation and co-relate hematological parameters & bone marrow findings with clinical findings, in differentiating various causes of pancytopenia.

2) To estimate frequency of different diseases producing pancytopenia.

MATERIALS AND METHODS

SOURCE OF STUDY:

Data consists of primary data collected by the principal investigator directly from 100 cases of PANCYTOPENIA patients admitted in the medical ward in Coimbatore Medical College Hospital.

DESIGN OF STUDY: Observational/Cross sectional study

PERIOD OF STUDY: ONE YEAR(July 2017 – JUNE 2018)

SAMPLING METHOD: Random sampling

METHODOLOGY:

This is a cross sectional observational study of 100 PATIENTS of PANCYTOPENIA admitted in the medical ward of Coimbatore Medical College Hospital. All the test was done with due permission from the Institutional Ethical Committee and informed consent from the subjects.

Inclusion criteria

1) All patients above age 18 yrs & below 65 yrs.
2) Patients with Hb <10 g%,Total leucocyte count <4000 cells/mm3,platelet count < 1,50000 cells/mm3.

Exclusion criteria

1) Patients below 18yrs of age.
2) Diagnosed case of malignancy including leukaemia receiving chemotherapy or radiotherapy.
3) Consent not given.

Methods of study:

Data is collected using pretest proformas according to the objectives of the study. After getting informed signed consent, detailed history and examination were done in 100 patients included in the study. The aim and purpose of study was informed to the patients and thereby informed written consent for participating in the study & for doing invasive procedures like bone marrow aspiration, bone marrow trephine biopsy were obtained.

Those patients who satisfied all the inclusion and exclusion criteria were selected for the study

INVESTIGATIONS

1. ROUTINE COMPLETE BLOOD COUNT

   HB, TC,PLATELET COUNT,MCV

2. OTHER INVASTIGATION

   ESR

  RETICULOCYTE COUNT

        SERUM LDH

        SERUM VITAMIN B12 LEVEL

        HIV-1 AND HIV 2 TEST (VCTC)

2. BLOOD BIOCHEMISTRY

      Blood urea

      Serum creatinine

Complete Liver Function Test

Total/direct/indirect bilirubin

SGOT

SGPT

Total Protein

S.Albumin

S.Globulin

Alkaline phosphatase

3. ECG

4. IMAGING STUDIES

ULTRASOUNG ABDOMEN PELVIS

Chest X ray PA view

5. PERIPHERAL SMEAR FOR PATHOLOGIST OPINION

6. BONE MARROW ASPIRATION CYTOLOGY

7. BONE MARROW TREPHINE BIOPSY (if necessary)

8. SPECIAL INVESTIGATIONS like ANA, THYROID FUNCTION TEST, SERUM PROTEIN ELECTROPHORESIS, CD4 COUNTS, UPPER GI ENDOSCOPY, SPUTUM FOR AFB STAINING was done only for appropriate needed patients.

STATISTCAL METHODS

All the datas were entered in a data collection sheet in an Excel format and analysed using SPSS Software. Numerical values were reported using mean and standard deviation or median. Categorical values are reported using number and percentages. Probability value (p) value less than 0.05 was considered as **statistically significant.**

REVIEW OF LITERATURE

DEFINITION

Pancytopenia is defined as deficiency of red cells, neutrophils, monocytes and platelets in the blood below the normal range.

NORMAL HAEMOPOIESIS

Various anatomical sites are involved in haemopoiesis during foetal life. The first site to begin is yolk sac then the function is taken over by the liver and to a certain extent by spleen during 2^{nd} to 7^{th} month of foetal life. Later the final site of production is taken care of by the bone marrow after birth, except lymphocytes which depends on other organs for its production more than bone marrow.

Multipotent haematopoietic stem cells, they differentiate themselves into various lineages such as myeloid and lymphoid. Erythrocytes, neutrophils, monocytes, mast cells and megakaryocytes are from erythroid lineage. Whereas T and B cells and natural killer cells are from lymphoid lineage.

STUDIES ON PANCYTOPENIA:

The relationship between blood and the marrow was established by Neumann and Bizzozero. Studies on bone marrow failure dates back to 18^{th} century, where Paul Ehrlich found a woman who died after a short illness marked by high fever, severe anemia and bleeding. He described the mechanism of failed blood cell regeneration and fatty infiltration of marrow and absence of nucleated

RBCs. This disease was named as pernicious anemia with yellow marrow, as named by Vaquez and Aubertin. Pancytopenia is association with aplastic anemia and aleukemicleukemia as described by Adams E B. Lorenz et al explained association of aplastic anemia with viral hepatitis. A group of patients with acute myelogenous leukemia presented as pancytopenia with predominant grnaulocytopenia described by Howel et al. and hairy cell leukemia presenting as splenomegaly, pancytopenia and recurrent infections by Zidal et al.

Throughout the world, aplastic anemia has been reported as the commonest cause of pancytopenia. But studies done in India show megaloblastic anemia as the most common cause of pancytopenia, especially the largest study done by Khunger et al with 200 pancytopenia patients. The same study also described that DNA damage in stem cells may lead to a failure of proliferation, and that has been concluded as the causative mechanism in aplastic anemia. Most of the studies on aplastic anemia describe idiopathic cause as the commonest etiology.

Chloramphenicol, an antibiotic causes dose dependent suppression of hemopoiesis, through its action on mitochondrial DNA and recovery takes 4months after discontinuation of the drug and use of hematinics. Acquired parvo virus B19 infection in a child with hereditary spherocytosis developed transient pancytopenia.

VARIOUS CAUSES AND PATHOPHYSIOLOGY OF PANCYTOPENIA

(TABLE-4.1)

HYPOCELLULAR MARROW	NORMOCELLULAR/ HYPERCELLULAR MARROW
APLASTIC ANEMIA (<25% cellularity)	MEGALOBLASTIC ANEMIA
MYELOFIBROSIS	MYELODYSPLASTIC SYNDROMES
RADIATION TOXICITY	HAIRY CELL LEUKEMIA
CHEMOTOXIC DRUGS	CONNECTIVE TISSUE DISORDERS
ACUTE LYMPHOID LEUKEMIA (rare)	PAROXYSMAL NOCTURNAL HEMOGLOBINURIA
LYMPHOMAS OF BONE MARROW	VARIOUS INFECTIONS
	ALEUKEMIC LEUKEMIA

Pancytopenia can present in two forms from the bone marrow picture, as

Hypocellular and Normocellular/Hypercellular marrow.

Other causes with Cellular Bone Marrow:

⇒ Myelophthisis

⇒ Systemic Lupus Erythematosis

⇒ Overwhelming infections

⇒ Hypersplenism

⇒ Alcoholism

⇒ Brucellosis

⇒ Sarcoidosis

Other rare causes with hypocellular bone marrow

- Q fever
- Legionnaire's disease

- Anorexia nervosa
- Mycobacteria

CLINICAL FEATURES

It is insidious in onset and manifestations vary from patient to patient depending on the cell counts. Patient may present with symptoms of anemia like pallor, easy fatiguability, palpitations, pedal edema, bleeding manifestations due to thrombocytopenia, recurrent infections due to low neutrophil count. Organomegaly and lymphadenopathy warrants causes like leukemia, lymphoma, myelofibrosis and rarely SLE. Other common causes casues where these clinical signs will be absent are megaloblastic anemia, aplastic anemia. Pancytopenia in old age with bony signs should suspect multiple myeloma.

1. APLASTIC ANEMIA

The disorder can also occur after (1) prolonged high dose exposure to certain toxic chemicals eg. **Benzene**. (2) after specific viral infections eg.**epsteinbarr virus, HIV.** (3) idiosyncratic response to certain drugs eg.ticlopidine, chloramphenicol. (4) feature of connective tissue/ auto immune disorders. (5) rarely in association with pregnancy.

For diagnosis neutrophil count <1500/u L, platelets <50,000/u L, Hb<10g/dl, absolute reticulocyte count <40,000/u L accompanied by hypocellular

marrow**in the absence of an abnormal infiltrate and with no increase in reticulin.**

ETIOLOGICAL CLASSIFICATION OF APLASTIC ANEMIA[3]

ACQUIRED CAUSES:

1. Idiopathic (most common cause)
2. Auto immune/connective tissue disorders: eosinophilic fasciitis, immune thyroid disease, rheumatoid arthritis, SLE
3. Drugs
4. Toxins eg. benzene, organophosphates
5. Viruses EBV, HIV
6. Paroxysmal nocturnal hemoglobinuria
7. Thymoma
8. Pregnancy
9. Iatrogenic eg. Radiaton, cytotoxic drug therapy

INHERITED:

1. Fanconianemia
2. Dyskeratosiscongenita
3. Shwachman-Diamond syndrome
4. Amegakaryocytic thrombocytopenia
5. Reticular dysgenesis[4]

POTENTIAL MECHANISMS: pathways responsible for acquired marrow cell failure include 1) cellular or humoral immune suppression of marrow 2) progressive erosion of chromosome telomeres 3) direct toxicity to hematopoietic multipotential stem cells 4) defect in stromal micro environment of the marrow required for hematopoietic cell development 5) impaired production or release of essential multi lineage hematopoietic growth factors[9].

IDIOPATHIC Aplastic anemia has an underlying genetic predisposition. HLA DR2 especially DR15 split association is seen. Enhanced apoptosis of remaining early progenitor cells due to both quantitative and qualitative stem cell defect is seen.

DRUG induced aplastic anemia: it is seen most often with anti-neoplastic drugs. For example Alkylating agents –busulfan, cyclophosphamide, melphalan, nitrogen mustard. Anti-metabolites – fluorouracil, mercaptopurines, methotrexate. Cytotoxic antibiotics – daunorubicin, doxorubicin, mitoxantrone. These drugs cause dose dependent marrow suppression. There are another class of drugs which cause aplastic anemia by idiosyncratic reactions. Chloramphenicol is the most notorious drug to cause aplastic anemia. Other examples ticlopidine.

TOXINS: benzene is the most common toxin causing aplastic anemia as it is found in organic solvents, petroleum products and coal tar derivatives. Inhibition of DNA synthesis causes bone marrow failure in chronic arsenic poisoning[26].

PREGNANCY associated aplastic anemia, relationship between the two is not always clear. In some cases pre-existing aplastic anemia is exacerbated with pregnancy. In both the cases treatment is termination of pregnancy and supportive management[21].

FANCONI ANEMIA: (Autosomal Recessive) occurs due to loss of Fanc gene, as a result causes failure of DNA repair. Chromosome breakage is used as screening test[22].

DYSKERATOSIS CONGENITA: associated with DKC, TERC, TERT gene mutation leading to telomere shortening. Telomere length is assessed as a screening test.

SHWACHMAN DIAMOND SYNDROME: SBDS gene mutation associated with pancreatic insufficiency[4].

DIAMOND BLACKFAN SYNDROME: RPS19, PRS24 gene mutation, in contrast to other inherited syndromes, this one causes pure red cell aplasia.

CLINICAL FEATURES: pallor, recurrent infections, bleeding manifestations such as ecchymoses, petechiae, retinal hemorrhages. Organomegaly and lymphadenopathy are never present

ON INVESTIGATIONS:

Reduction in all 3 cell lines will be significantly present with reticulocyte count less than 1%. Peripheral smear is not diagnostic and bone marrow aspiration study most often will be a dry tap. Hence bone marrow trephine biopsy is diagnostic where the marrow is replaced by **fatty infiltration with no other abnormal cells seen along with it and cellularity less than 25%**

TREATMENT: Allogenic hematopoietic stem cell transplantation is curative in approximately 80% of younger patients with high-resolution human leukocyte antigen-matched sibling donors, although the post-transplant period may be complicated by severe graft versus host disease[10]. The disease may be significantly ameliorated or occasionally cured by immunotherapy, especially a regimen coupling **ANTI-THYMOCYTE GLOBULIN (40mg/kg/day) with Cyclosporine.** Even after successful treatment the disease may relapse or evolve into a clonal myeloid disorder such as PNH.

Supportive therapy with multiple blood transfusions to maintain the haemoglobin and platelet counts. Any bleeding manifestations should be promptly intervened. Estrogen therapy to suppress the menstruation is important. Hematopoietic growth factors such as G-CSF, GM-CSF are not recommended as initial therapy[5].

2. MEGALOBLASTIC ANEMIA

Deficiency of either folate or cobalamin leads to macrocytic anemia with or without cytopenias as a result of megaloblastic hematopoiesis, a manifestation of defective DNA synthesis. Folate in its tetrahydro form is a transporter of one-carbon fragments, which it can carry at any of three oxidation levels: methanol,

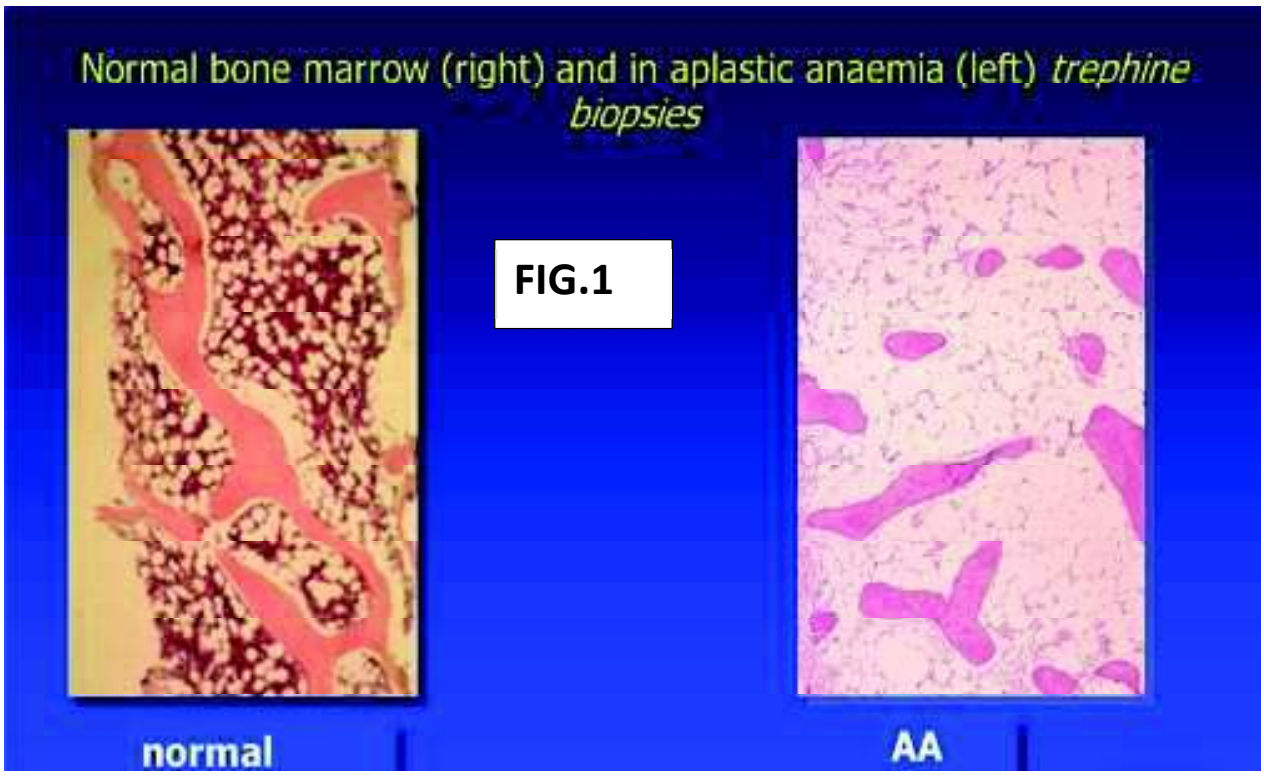


FIG.1

formaldehyde or formic acid. The oxidation levels of folate-bound one-carbon fragments can be altered by oxidation and reduction reactions that require NADP or NADPH form. During biosynthesis of purines and methionine, free folate is released in its tetrahydro form. During biosynthesis of thymidine, tetrahydrofolate is oxidised to the dihydro form and must again be fully reduced by dihydrofolate reductase to continue functioning in one-carbon metabolism[1].

Cobalamin is required for two reactions: intramitochondrial conversion of methylmalonyl CoA to succinyl CoA and cytosolic conversion of homocysteine to methionine, a reaction in which the methyl group of methyltetrahydrofolate is donated to the sulfur atom of homocysteine. In cobalamin deficiency, methyltetrahydrofolate accumulates because donation of the methyl group to homocysteine is the only method of generating free tetrahydrofolate from methyltetrahydrofolate[25].

CAUSES:

FOLATE DEFICIENCY:

A. DECREASED INTAKE
    1) Nutritional
    2) Hyperalimentaion
    3) Hemodialysis
    4) Premature infants
    5) Spinal cord injury

6) Goat's milk anemia

B. IMPAIRED ABSORPTION

1) Non-tropical sprue

2) Tropical sprue

C. INCREASED REQUIREMENTS

1) Pregnancy

2) Increased cell turnover

3) Chronic haemolytic anemia

4) Exfoliative dermatitis

COBALAMINE DEFICIENCY:

A. IMPAIRED ABSORPTION

1) Pernicious anemia (Most common)

2) Gastrectomy

3) Zollinger-Ellison syndrome

4) Ileal disease or resection

5) Blind loop syndrome

6) Fish tapeworm

7) Pancreatic insufficiency.

B. DECREASED INTAKE: Vegans

FOLATE DEFICIENCY:

In pregnancy, even a mild folate deficiency may be associated with severe neural tube defects in the fetus, so pregnant women should always receive folate supplements. Diagnosis of folate deficiency is based on measurements of folate in serum which gives information about the current level of folate, and in red cells which provide information on aggregate folate status over the preceding period during which those red cells were produced.

Nutritional folate deficiency is treated with oral folic acid tablets. Folate deficiency as a result of malabsorption occurs in tropical and non-tropical sprue. Tropical sprue is treated with folate supplements and antibiotics. In non-tropical sprue, the treatment is folate plus a gluten-free diet[24].

VITAMIN B12 DEFICIENCY:

Most common cause of clinically apparent cobalamin deficiency is pernicious anemia., a condition in which the portion of gastric mucosa that contains the parietal cells is destroyed through an auto-immune mechanism. Parietal cells secrete intrinsic factor, which is essential for physiologic cobalamin absorption. Without intrinsic factor, a state of cobalamin deficiency develops over the course of years. Cobalamin deficiency leads not only to megaloblastic anemia but also to demyelinating disease that manifests itself as peripheral neuropathy, spastic paralysis with ataxia (subacute combined degenerative disorder), dementia,

psychosis. Subtle cobalamin deficiency, which may manifest as neurologic symptoms without anemia is common among elderly. The incidence of gastric cancer is increased by two-three fold in patients with pernicious anemia[2].

It is diagnosed by measuring the level of either total or TC-bound vitamin in the blood or by measuring serum methylmalonic acid, which accumulates in the bloodstream in patients with cobalamin deficiency. If a patient with B12 DEFICIENCY, is treated with folic acid, the anemia may be corrected but the neurological abnormalities persist. Patients with B12 deficiency usually are treated with parenteral cobalamin but large doses of oral cobalamin may be used.

CLINICAL FEATURES:

Affection of haematological, gastrointestinal and nervous system. Symptoms of anemia and thrombocytopenia will be present. Gastrointestinal manifestations include sore tongue, beefy red tongue, loss of appetite and loss of weight, diarrhoea. CNS manifestations include numbness, paresthesia in the extremities, ataxia, subacute combined degenerative disease. The CNS manifestations alone are not seen with folate deficiency[13].

ON INVESTIGATIONS: Raised MCV with macro ovalocytes with anisopoikilocytosis is characteristic. Hypersegmented neutrophils (1 with 6 lobes or >5% with 5 lobes). Leucoerythroblastic picture. In barrow marrow study,

feature of abnormal erythropoiesis -orthonormoblasticmegaloblasts and abnormal leukopoieis – giant metamyelocytes, band forms and hypersegmented neutrophils

TREATMENT:

B12 deficiency - parenteral replacement with 1000ug of methylcobalamin daily for 1 week followed by weekly for 8weeks and monthly once for the rest of the life.

Folate deficiency – replacement with a dosage of 1mg/day by oral and may be upto 5mg/day.

3. MYELODYSPLASTIC SYNDROMES (MDS)

MDS are heterogenous group of clonal hematopoietic neoplasms defined by morphologic dysmorphia, one or more cytopenias and an increased risk of clonal evolution to acute myelogenous leukemia (AML). Most cases are acquired de novo through the accumulation of somatic mutations, although a small fraction arises after exposure to DNA damaging agents such as chemotherapy and radiation[7].

The triad of MDS is **Refractory cytopenia, dysmorphic marrow and blast transformation.** The characteristic cells seen are **Ringed sideroblasts, pseudo pelgerheut cells and pawn ball megakaryocytes[8].**

CLASSIFICATION OF MDS:

1. **Refractory cytopenia of unlineage dysplasia:**

   It could be a refractory anemia or refractory leukopenia or thrombocytopenia (>10% in particular lineage should be abnormal to say its significant)

2. **Refractory cytopenia of multilineage dysplasia:**

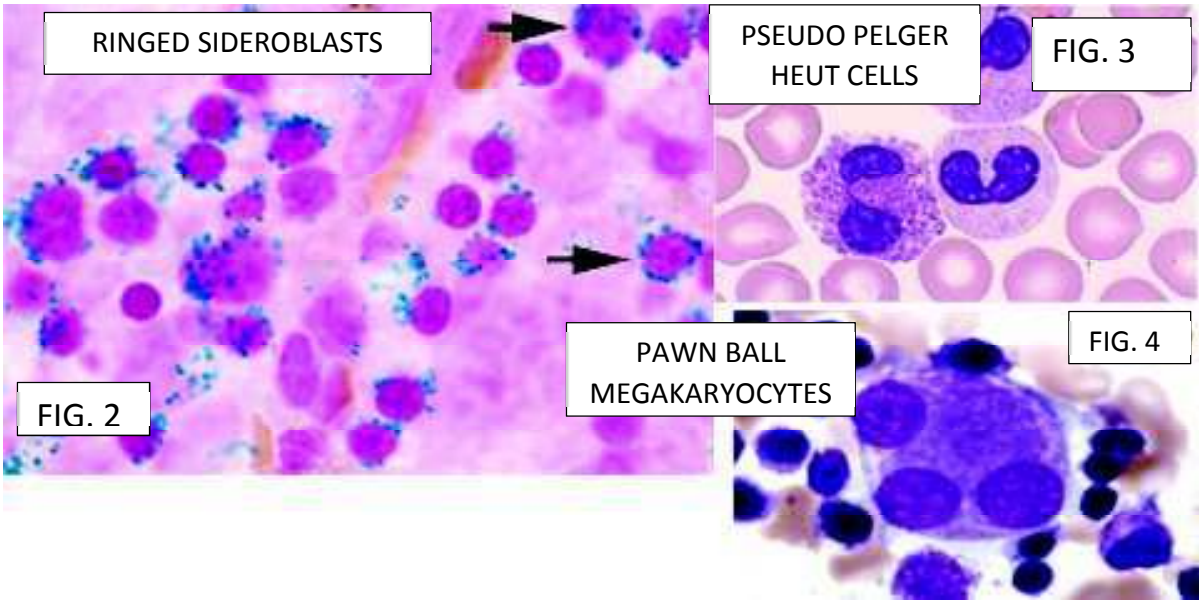
   More than one lineage involvement in the above comes under this category (>10% in each lineage should be abnormal)

3. **Refractory anemia with ringed sideroblasts:**

   Only the erythroid lineage is affected, >15% cells should be ringed sideroblasts. Sideroblasts are stained by Prussian blue / Perl's stain.

4. **Refractory anemia with excess blasts:**

   There are 2 types based on % of blast cells.



Type 1 - <5% blasts in peripheral smear

5-9% blasts in bone marrow

Type 2 – 5-19% blasts in peripheral smear

10-19% blasts in bone marrow

5. **MDS with isolated detetion of 5q syndrome:**

It is the most common cytogenicanormality in Adult MDS, it has good prognosis and specific feature is thrombocytosis. Whereas in children 7q deletion is more common[20]. Lenalidomide is an immunomodulator used to treat this particular subtype with better response.

TREATMENT:

Lower-risk MDS may benefit from hematopoietic growth factors or immune suppression with antithymocyte globulin and calcineurin inhibitors like tacrolimus.

Higher-risk MDS is treated with hypomethylating agents, azacytidine or decitabine or stem cell transplantation as a last resort[33].

Prognostic indicators of MDS are Blasts, Cytopenia and Karyotype.

4. HAIRY CELL LEUKEMIA

It is an uncommon form of adult chronic B-cell leukemia whereas the cell of origin is uncertain. At diagnosis the characteristic leukemic cells are found in the marrow, blood and the spleen. The triad of hairy cell leukemia is Massive splenomegaly, Pancytopenia and vasculitis like syndrome (erythema nodosum cutaneous nodules).

In peripheral smear, characteristic hairy cells are seen along with it severe neutropenia and monocytopenia are present. Bone marrow aspirate is commonly dry tap so bone marrow biopsy is diagnostic with **fried egg appearance**[12]**.**

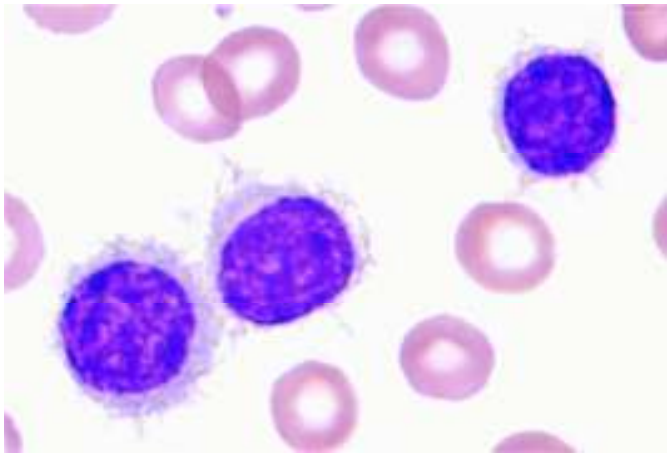


Fig : 5 Hairy Cell in Peripheral Smear

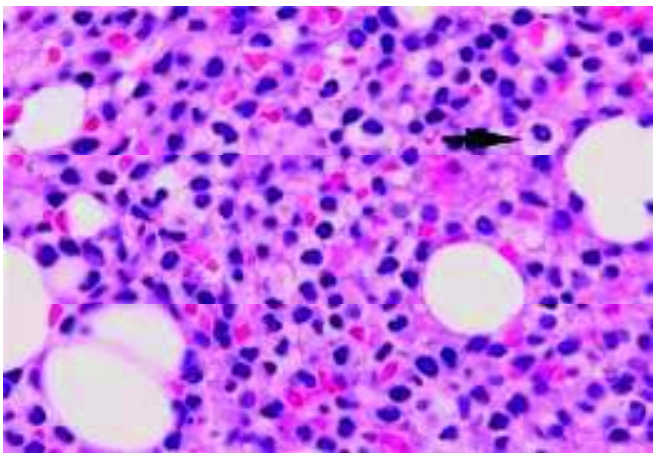


Fig : 6 FRIED EGG APPEARANCE IN BONE MARROW

Most accurate test is flow cytometry where we look for **CD103**(characteristic), **CD22, CD11c**. A characteristic test is the demonstration that acid phosphatase staining reaction in the cell is resistant to the action of TARTRATE **(TRAP** + tartrate resistant acid phosphatase). A variant of hairy cell

leukemia is positive for **BRAFV600E** mutation and lastly **DBA44 staining** positive[13].

TREATMENT:

Cladribine and deoxycoformycin are effective in producing long periods of disease control. Splenectomy for severe cytopenic patients. BRAFinhibitors like Vemurafenib is effective and also Rituximab is being used. There is no role for steroids.

5. ALEUKEMIC LEUKEMIA:

In acute leukemias the total leukocyte count ranges between subnormal to markedly elevated levels. In about one fourth of the patients the total count at the onset is reduced between 1000-4000/mm3.

In such patients blasts cells may be very less in number in peripheral smear where buffy coat smear will help in detecting blasts. So peripheral smear will be confusing with immature red and white cells with predominant blasts cells[34]. Bone marrow examination will provide the diagnosis.

6. PRIMARY MYELOFIBROSIS:

It is one of the 8 neoplasms classified under Myeloproliferative Neoplasms that originate in the clonal expansion of a single hematopoietic multipotential cell reprogrammed by several somatic mutations. Approximately 90% of cases have a

mutation in the Janus kinase 2 (JAK2) gene, the calreticulin (CALR) gene or the thrombopoietin receptor (MPL) gene. The disease is characterised classically by anemia, mild neutrophilia, thrombocytosis and splenomegaly. About 15% cases present as bi- or tri-cytopenias. The peripheral smear shows triad of **tear drop RBCs, leukoerythroblastic picture and Giant platelets.** Bone marrow shows increased number of neoplastic dysmorphic megakaryocytes and increased reticulinfibers and collagen fibrosis. Fibrosis of bone marrow is not diagnostic of myelofibrosis as the disease has 2 phases, 1) cellular phase, where marrow is hypercellular and has dysplastic megakaryocytes, 2) fibrotic phase, where the marrow shows fibrosis.Osteosclerosis may also be present. Neutrophilic alkaline phosphatase score is high[8].

The disease may be complicated by 1) portal hypertension and gastro-esophageal varices as a result of very large splenic blood flow and loss of compliance of hepatic vessels, 2) extramedullary fibrohematopoietictumors that can develop in any tissue and lead to symptoms by compression of vital structures, 3) abdominal vein thrombosis (Budd chiari syndrome).

TREATMENT:

JAK2 inhibitors are first line therapy for splenomegaly and constitutional symptoms like fever, night sweats, weight loss. Other treatments are 1) hydroxyurea for thrombocytosis, massive splenomegaly, 2) androgens,

erythropoietin, red cell transfusions for severe anemia, 3) local irradiation of fibrohematopoietic tumors or a massive symptomatic spleen, 4) splenectomy for severe cytopenias. In younger patients, allogenic stem cell transplantation is curative and nonmyeloablative transplantation has been successful upto 60years of age. The disease may be indolent for years and may be rapidly progress to massive splenic enlargement or by transformation to acute myelogenous leukemia.

7. PAROXYSMAL NOCTURNAL HEMOGLOBINURIA:

This disease is because of an acquired mutation in hematopoietic stem cell, PIG-A gene which is associated with acquired intrinsic membrane defect in RBCs. This mutation leads to decrease in synthesis of GlycosylPhosphatidyl Inositol anchor in the RBCs.

Normally CD55 and CD59 are anchored to the RBCs via GPI, this CD factors are vital in inhibition of complement pathway and not formation of membrane attack complex. Due to the mutation in GPI, CD factors fail to anchor to RBCs and fail to inhibit the complement pathway. As a result activation of membrane attack complex will result in increased susceptibility to all the three cell lines.

1) Red cell lysis causes Intravascular hemolysis, anemia, hemoglobinuria, hemosiderinuria and reticulocytosis.
2) Granulocyte lysis leads to granulocytopenia

3) Thrombocytopenia.

The triad of PNH is Intravascular hemolysis, Pancytopenia and increased risk of Venous thrombosis.

Most of the clinical features of PNH canbe attributed to intravascular hemolysis and it is paroxysmal and usually occurs at night. During sleep at night, we all tend to retain Co2 leading to mild respiratory acidosis, low pH leads to activation of complement pathway, so the first urine sample in the morning will be black. Splenomegaly is never a feature of PNH.

The mechanism of thrombosis is due to, as the external surface of RBCs are damaged, the inner surface which expresses Phosphatidyl serine is exposed to the circulation which causes activation of Protein C, S and in-turn activates Thrombosis.

Flow cytometry is the gold standard in diagnosis, analysis of GPI linked CD55, CD59. Neutrophilic alkaline phosphatase is decreased.

Causes of death in PNH are: 1) venous thrombosis, most common cause of death is cortical vein thrombosis, 2) infections, 3) bleeding.

TREATMENT:

Eculizumab is a monoclonal antibody that specifically binds to the complement C5, thus preventing the formation of membrane attack complex.

8. CONNECTIVE TISSUE DISORDERS:

The incidence of severe aplastic anemia was sevenfold greater than expected in patients with **rheumatoid arthritis**. It is uncertain whether the aplastic anemia is related directly to rheumatoid arthritis or to various drugs used to treat the condition (gold salts, D-penicillamine and non-steroidal anti-inflammatory agents).

Occasional cases of aplastic anemia are seen in conjunction with **systemic lupus erythematosus**[33].The most common findings were dyserythropoiesis and hypoplasia. Neither feature was definitely related to cytotoxic drug therapy as most cases were treated by steroids only. **Gelatinous transformation**, a condition characterised by disruption of marrow architecture, fat atrophy and deposition of Hyaluronic acid, was seen in the hypoplastic marrows of SLE patients. Another frequent finding which was seen was lymphocytosis associated with plasmacytosis.In vitro studies found either the presence of an antibody or suppressor cell directed against hematopoietic progenitor cells.

An unusual presentation reported with SLE, **Macrophage Activation syndrome**, manifested by fever, weight loss, arthritis, pericarditis, rash, myocarditis, nephritis, hepato-splenomegaly, anemia, leukopenia, hyperferritinemia, anti-DNA antibodies, low CRP and hypocomplementemia. Rarely, hyperplastic marrow was seen, indicating peripheral destruction of blood

cells and compensatory marrow hyperplasia. Other marrow changes seen in SLE patients were vasculitis, red cell aplasia and myelofibrosis. There is also an association between anti-phospholipid antibody syndrome and SLE referred as secondary APS or SLE-APS. Patients have recovered after plasmapheresis, glucocorticoids or cyclophosphamide therapy, mycophenolate mofetil, which is compatible with an immune etiology.

Eosinophilic fasciitis, an uncommon connective tissue disorder with painful swelling and induration of the skin and subcutaneous tissue, has been associated with pancytopenia. Although it may be antibody-mediated in some cases, it has been largely unresponsive to therapy. Nevertheless 1) stem cell transplantation, 2) immunosuppressive therapy with cyclosporine, 3) antithymocyteantiglobulin, 4) ATG with cyclosporine has cured or significantly ameliorated the disease in a few patients.

Severe aplastic anemia also has been reported coincident with immune thyroid disease (Grave's disease) and the aplasia has been reversed with treatment of hypothyroidism. Pancytopenia in association with thymoma, Autoimmune renal disease is present. The underlying relationship may be the role of cytotoxic T lymphocytes in the pathogenesis of several autoimmune diseases and in aplastic anemia.

9. INFECTIONS:

Epstein barr virus infection causing aplastic anemia is due to activation of cytotoxic immune response. Hepatitis non-A,-B,-C,-D,-E or -G infection leading to aplastic anemia is seen. Parvovirus-B19 infection causing aplastic crisis and pure red cell aplasia through a mechanism lysis of erythroid precursors. By infecting the stromal cells cytomegalovirus causes pancytopenia.

Advanced HIV with high viral load causes suppression of marrow or may be due to HAART. Human herpes virus-6 is implicated in marrow suppression following marrow transplantation. In AIDS patients, direct infection of either stem cells or progenitor cells does not have significant role in marrow failure[17].

Causes of Pancytopenia in HIV patients(TABLE-4.2)

Advanced HIV with high viral load
Drug side effects
Malignancy in the marrow Non-Hodgkin lymphoma, Hodgkin lymphoma
Infections in the marrow Mycobacterium avium complex, histoplasmosis, cytomegalovirus, Mycobacterium tuberculosis
Castleman disease
Hemophagocytic syndrome
Alcohol abuse
Vitamin B12 or Folate deficiency

Wide range of hematological abnormalities are associated with HIV co-infection[28]. The peripheral smear and other morphological findings can simulate myelodysplastic syndromes, T cell lymphoma and myeloproliferative neoplasms. Various studies conducted revealed that peripheral smear can show anemia or bicytopenia or pancytopenia. Bone marrow showed trilineage dysplasia, eosinophils, increased megakaryocytes, plasma cells, increased iron and reticulin fibrosis, rarely granuloma. Patients with hemophagocytic syndrome will present with fever, severe constitutional symptoms, cytopenias[30].

10. PANCYTOPENIA ASSOCIATED WITH CHRONIC LIVER DISEASE:

Anemia of diverse etiology is a common complication of this. The causes include gastrointestinal haemorrhage, hypersplenism secondary to portal hypertension. Aplastic anemia, may follow the development of hepatitis. Treatment of chronic viral hepatitis with Ribavirin causes hemolysis which can be reversed by reducing the dose or stopping the drug. Interferons causes bone marrow suppression. In patients with chronic liver disease, anemia is exacerbated by deficiency of folic acid/Vit B12 that occur following inadequate dietary intake or malabsorption.

RESULTS

PRIMARY DIAGNOSIS	SUB CLASS	NO OF PATIENTS
MEGALOBLASTIC ANEMIA(N=36)	NUTRITIONAL	18
	MALABSORPTION	4
	ALCOHOL INDUCED	14
INFECTIONS(N=12)	HIV	6
	TB	3
	MALARIA	3
MALIGNANCY(N=6)	ACUTE LYMPHOBLASTIC LEUKEMIA	2
	ACUTE MYELOCYTIC LEUKEMIA	1
	MULTIPLE MYEOMA	2
	HAIRY CELL LEUKEMIA	1
AUTOIMMUNE DISEASE(N=8)	SLE	7
	GRAVES DISEASE	1
CHRONIC LIVER DISEASE(N=10)		10
MYELODYSPLASTIC SYNDROME(N=10)		10
APLASTIC ANEMIA(N=18)		18

TABLE-5.1

AGE DISTRIBUTION IN 100 PANCYTOPENIA CASES (TABLE-5.2)

AGE IN YEARS	NO OF PATIENTS	PERCENTAGE
< 30	29	29%
31-40	21	21%
41-50	13	31%
51-60	4	4%
>60	33	33%

MEAN AGE- 43.75 ± 17.15

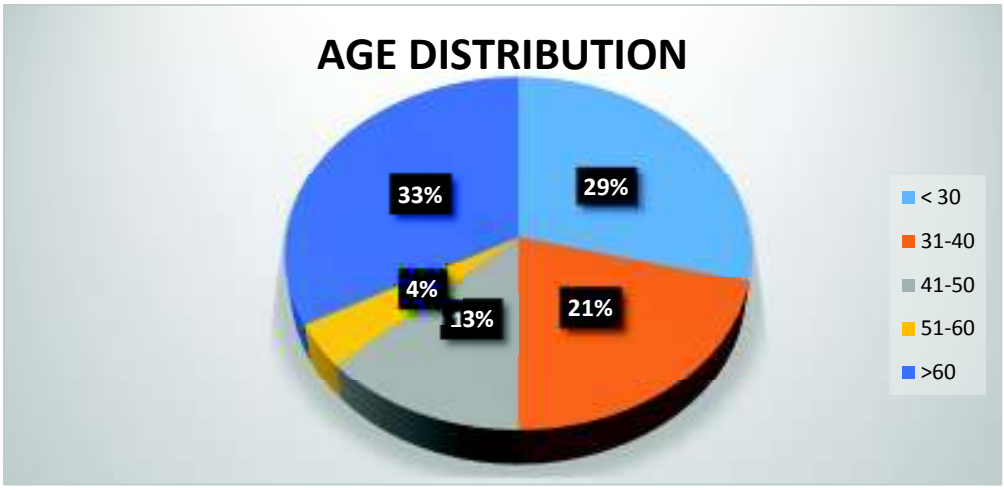
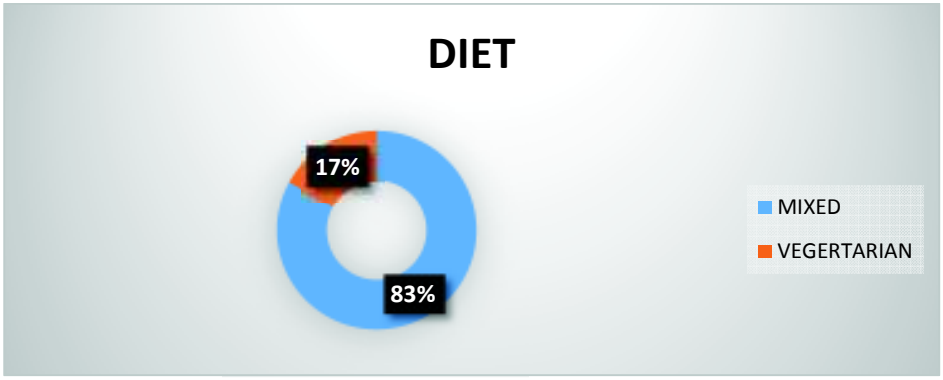
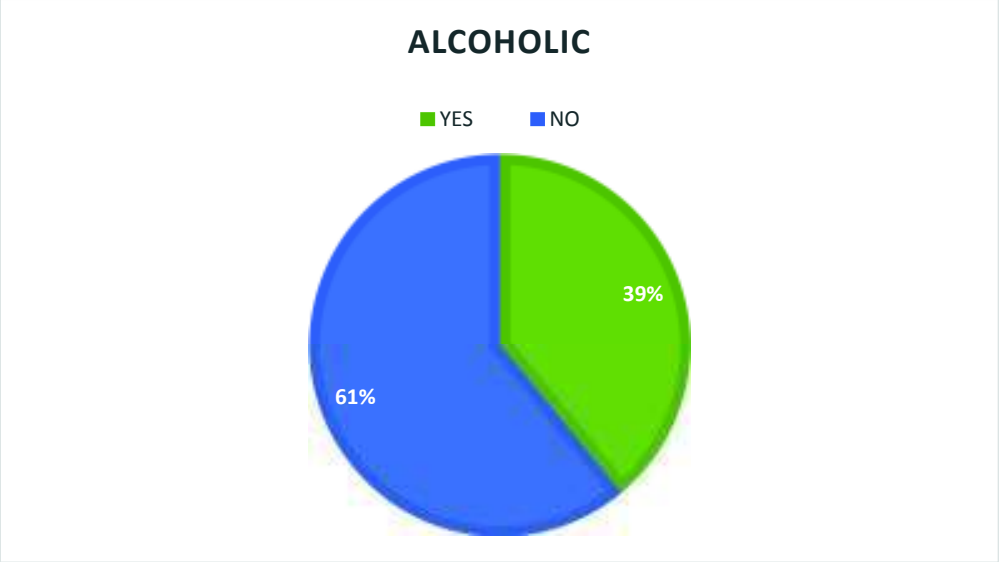


CHART NO. 1 & 2 – AGE AND SEX DISTRIBUTION IN 100 PANCYTOPENIA CASES

DIET HISTORY IN PANCYTOPENIA CASES(CHART NO.3)



ALCOHOLISM HISTORY IN PANCYTOPENIA CASES(CHART NO.4)



ASSOCIATED COMORBIDITIES IN PANCYTOPENIA PATIENT

(CHART NO.5)

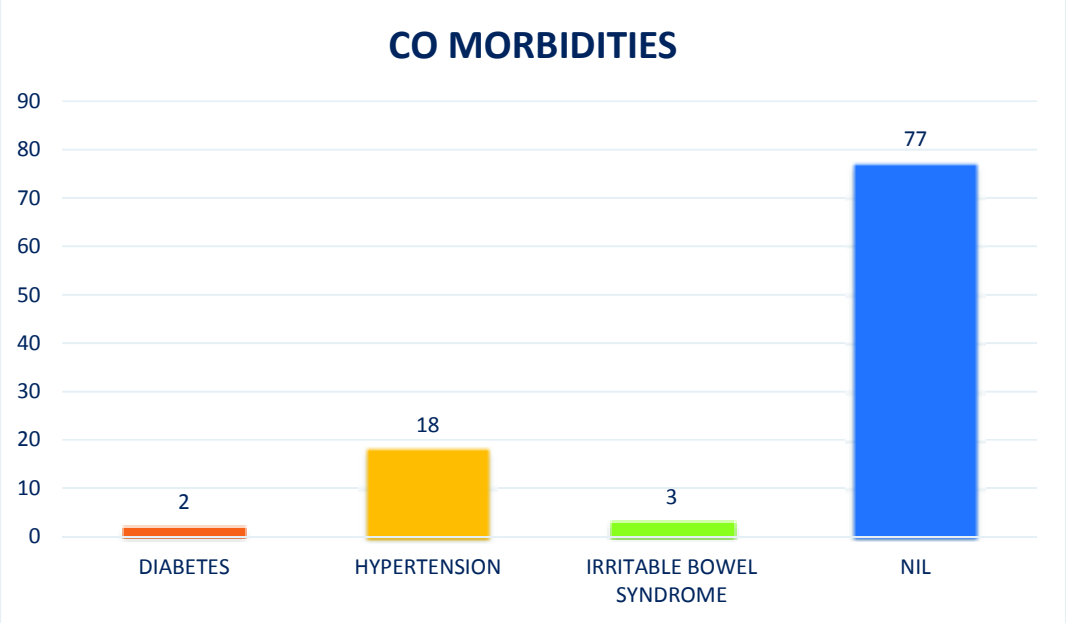
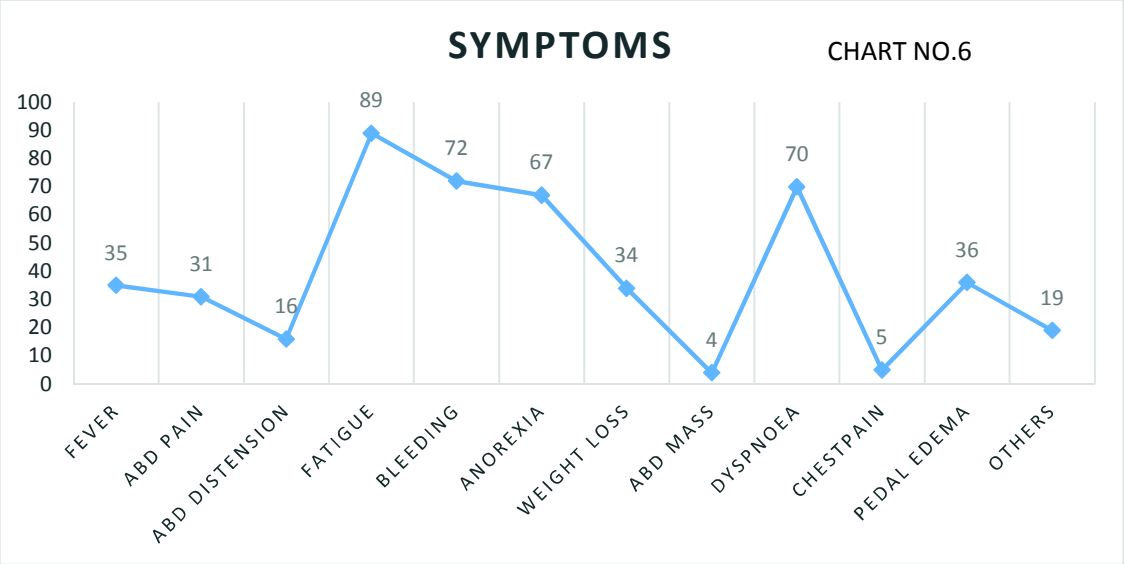


TABLE -5.3 SYMPTOMS IN 100 PANCYTOPENIA CASES

SYMPTOMS	NO OF PATIENTS	PERCENTAGE
FEVER	35	35%
ABD PAIN	31	31%
ABD DISTENSION	16	16%
FATIGUE	89	89%
BLEEDING	72	72%
ANOREXIA	67	67%
WEIGHT LOSS	34	34%
ABD MASS	4	4%
DYSPNOEA	70	70%
CHESTPAIN	5	5%
PEDAL EDEMA	36	36%
OTHERS	19	19%

CHART NO.6 - SYMPTOMS IN 100 PANCYTOPENIA CASES



SIGNS IN 100 PANCYTOPENIA CASES (TABLE-5.4)

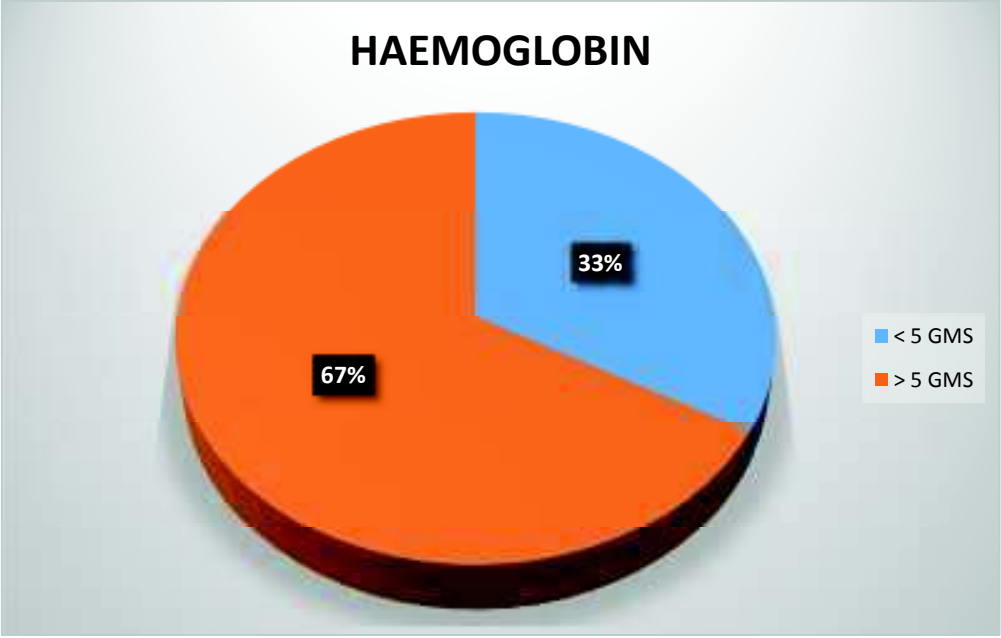
SIGNS	NO OF PATIENTS	PERCENTAGE
PALLOR	99	99%
HEPATOMEGALY	21	21%
SPLENOMEGALY	21	21%
BOTH (HEP+SPL)	10	10%
JAUNDICE	16	16%
CLUBBING	9	9%
LYMPHADENOPATHY	8	8%
BONY TENDERNESS	3	3%
CARDIAC FAILURE	27	27%
ASCITIS	15	15%
OTHERS	9	9%

CHART NO.7 - SIGNS IN 100 PANCYTOPENIA CASES

HAEMOGLOBIN IN 100 PANCYTOPENIA CASES (TABLE-5.5)

HAEMOGLOBIN	NO OF PATIENTS	PERCENTAGE
< 5 GMS	33	33%
> 5 GMS	67	67%

CHART NO.8 - HAEMOGLOBIN IN 100 PANCYTOPENIA CASES

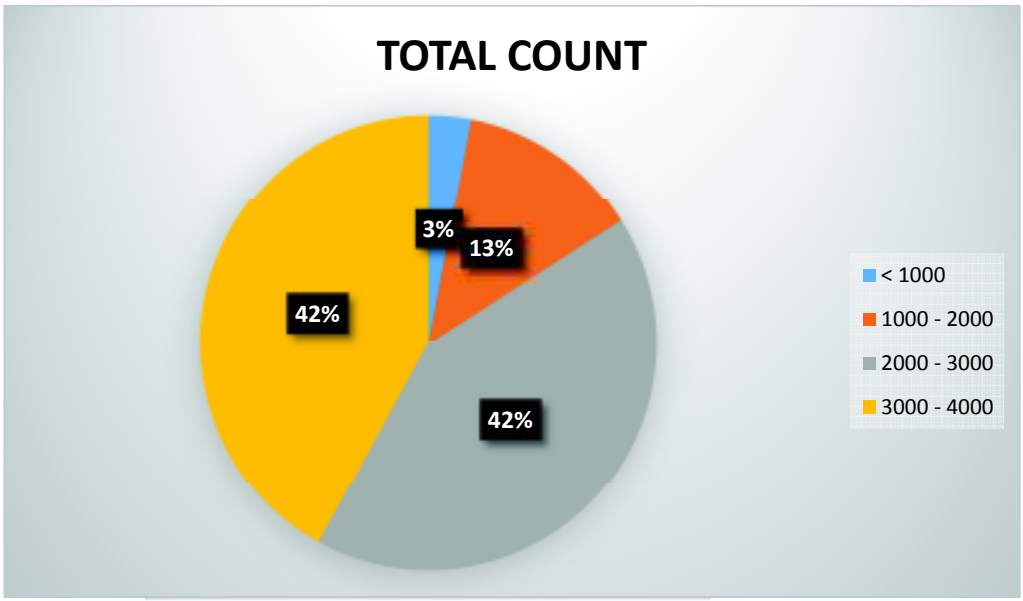


TOTAL LEUCOCYTE COUNT IN 100 PANCYTOPENIA CASES

(TABLE-5.6)

TOTAL COUNT	NO OF PATIENTS	PERCENTAGE
< 1000	3	3%
1000 - 2000	13	13%
2000 - 3000	42	42%
3000 - 4000	42	42%

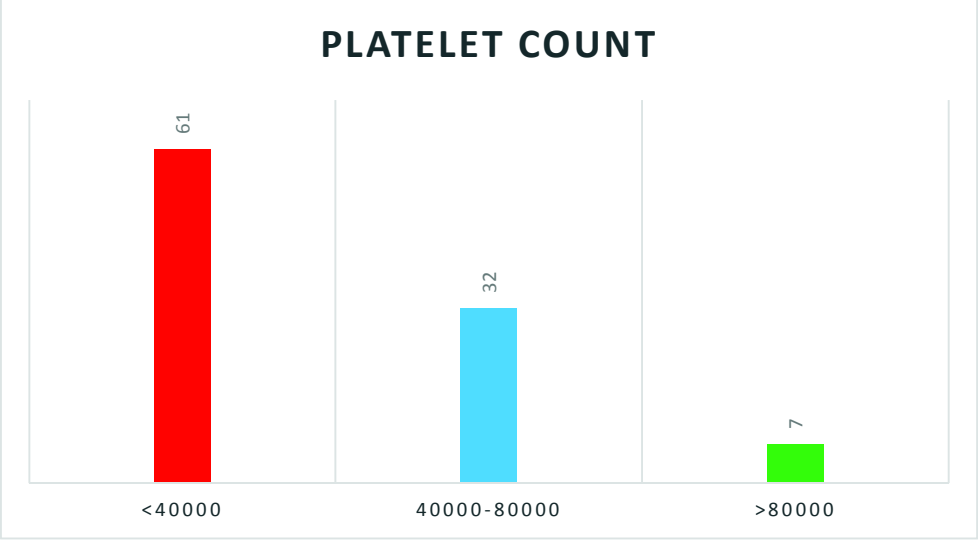
CHART NO.9 - TOTAL COUNT IN 100 PANCYTOPENIA CASES



PLATELET COUNT IN PANCYTOPENIA (TABLE-5.7)

PLATELET COUNT	NO OF PATIENTS	PERCENTAGE
< 40000	61	61%
40000-80000	32	32%
>80000	7	7%

CHART NO.10 - PLATELET COUNT IN PANCYTOPENIA

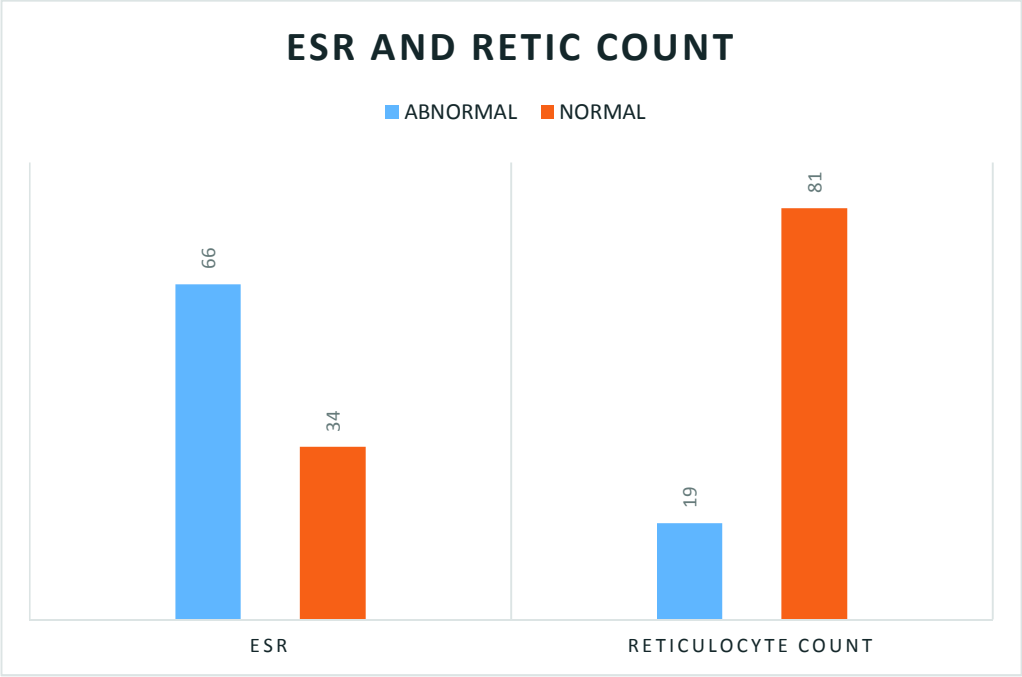


ESR AND RETIC COUNT IN PANCYTOPENIA

TABLE-5.8

OTHER PARAMETERS	ABNORMAL	NORMAL
ESR	66	34
RETICULOCYTE COUNT	19	81

CHART NO.11 – ESR AND RETIC COUNT IN PANCYTOPENIA

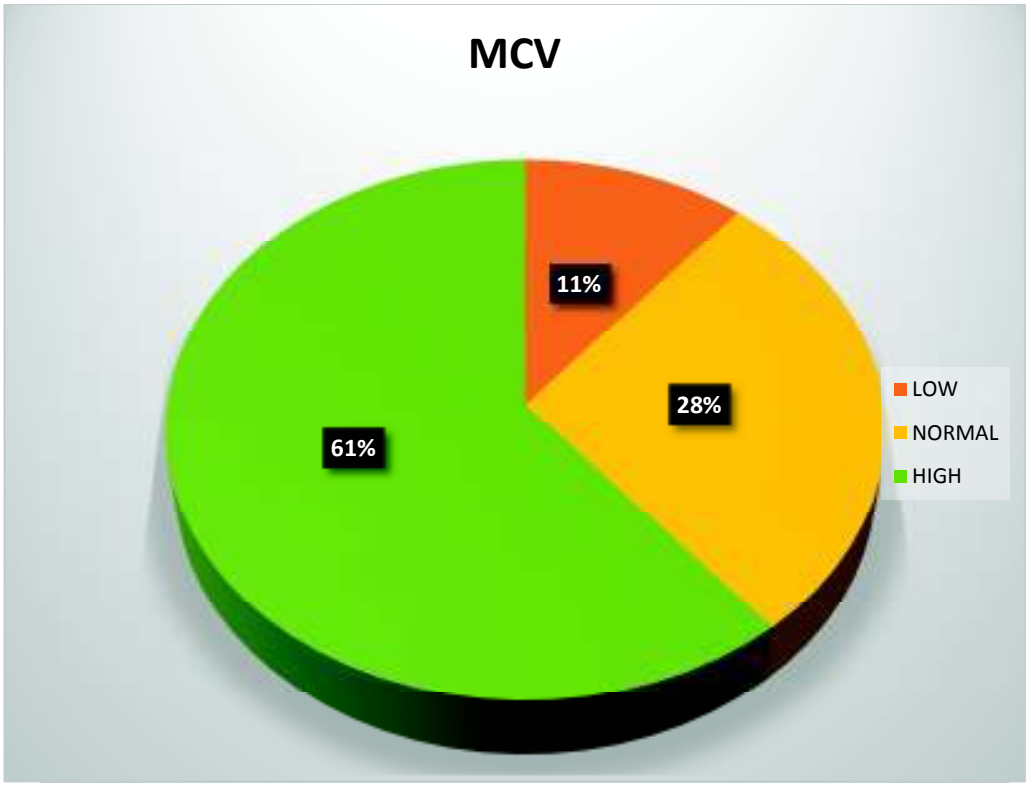


MEAN CORPUSCULAR VOLUME IN 100 PANCYTOPENIA CASES

(TABLE-5.9)

MCV	NO OF PATIENTS	PERCENTAGE
LOW	11	11%
NORMAL	28	28%
HIGH	61	61%

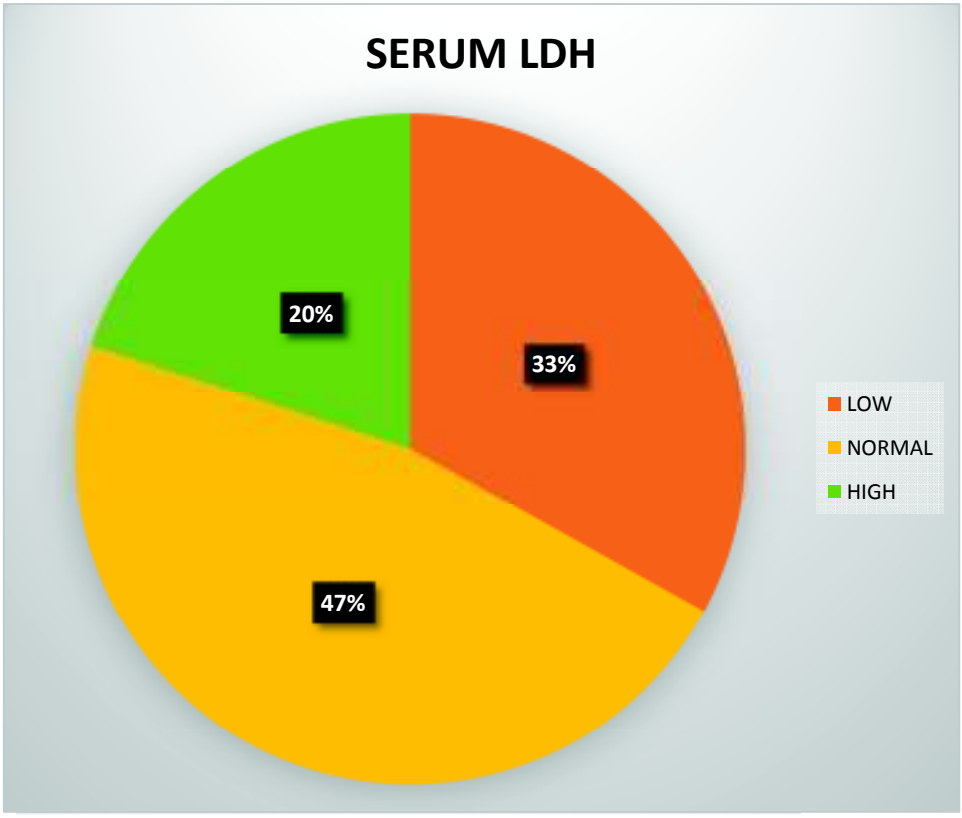
CHART NO.12 – MCV IN 100 PANCYTOPENIA CASES



SERUM LDH IN 100 PANCYTOPENIA CASES (TABLE-5.10)

SERUM LDH	NO OF PATIENTS	PERCENTAGE
LOW	33	33%
NORMAL	47	47%
HIGH	20	20%

CHART NO.13 – SERUM LDH IN 100 PANCYTOPENIA CASES



HIV STATUS IN 100 PANCYTOPENIA CASES(TABLE-5.11)

HIV STATUS	NO OF PATIENTS	PERCENTAGE
POSITIVE	6	6%
NEGATIVE	94	94%

CHART NO.14 – HIV STATUS IN 100 PANCYTOPENIA CASES

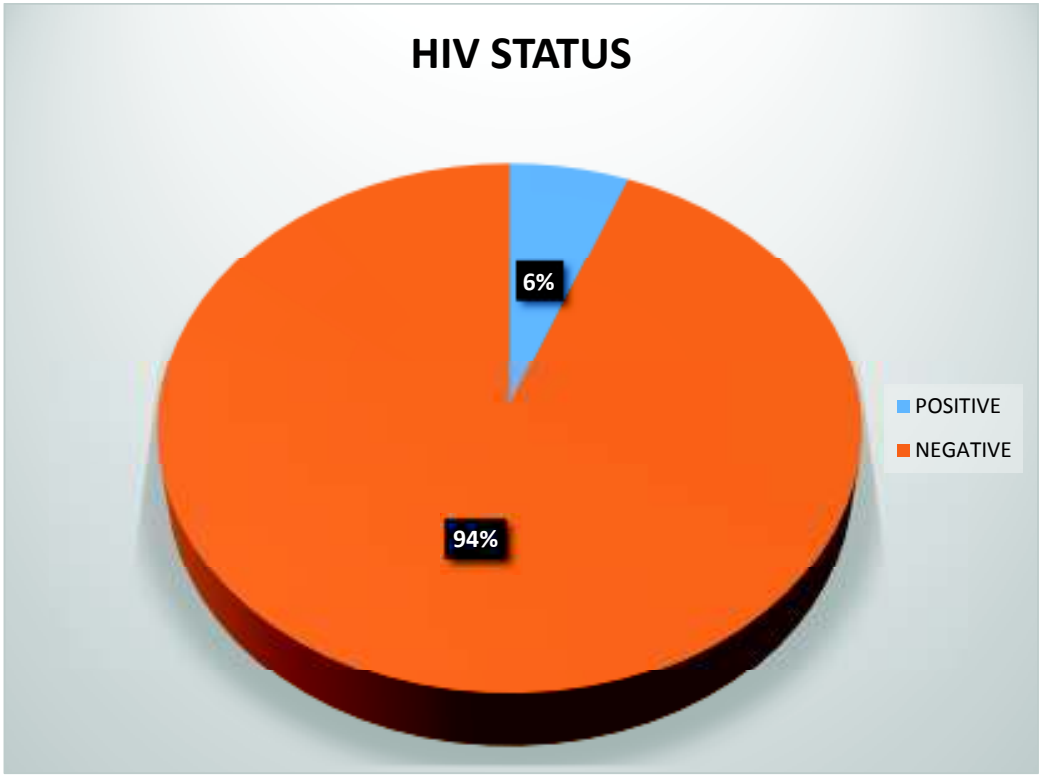
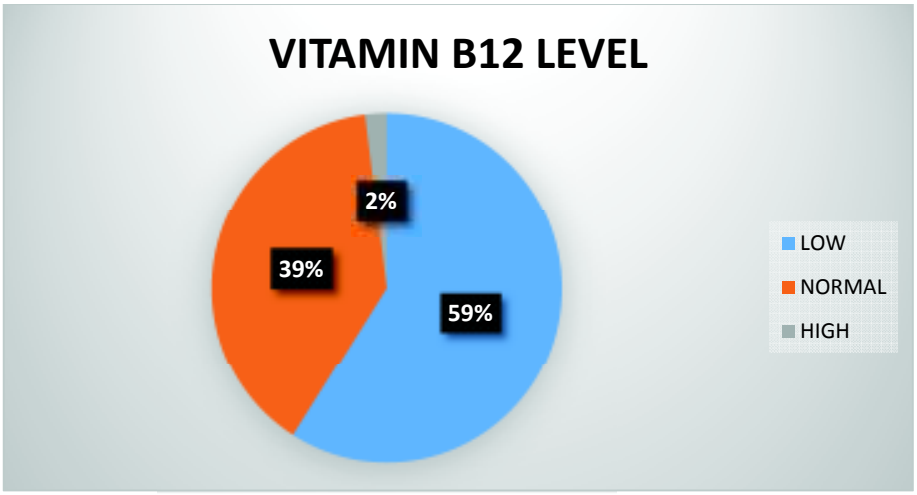


TABLE-5.12 VITAMIN B12 LEVEL IN 100 PANCYTOPENIA CASES

VITAMIN B12 LEVEL	NO OF PATIENTS	PERCENTAGE
LOW	59	59%
NORMAL	39	39%
HIGH	2	2%

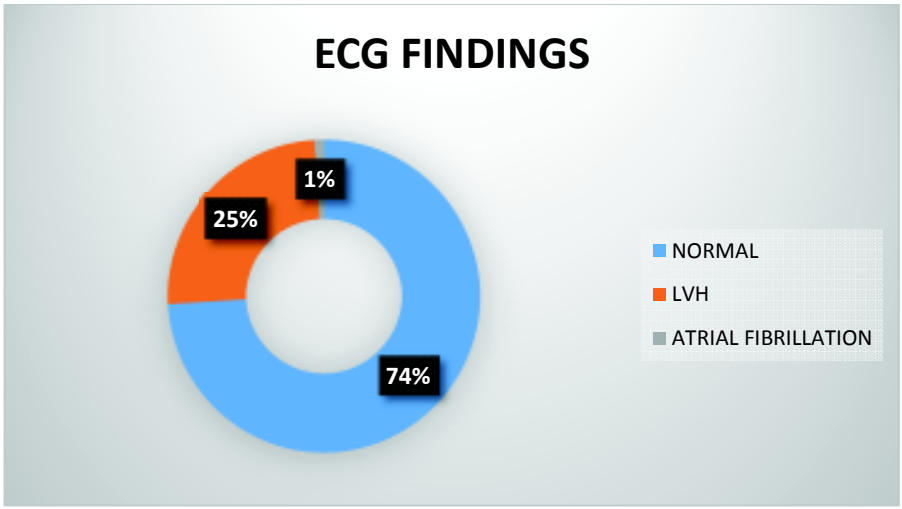
CHART NO.15 – VITAMIN B12 LEVEL IN 100 PANCYTOPENIA CASES



ELECTRO CARDIOGRAM (TABLE-5.13)

ECG	NO OF PATIENTS	PERCENTAGE
NORMAL	74	74%
LVH	25	25%
ATRIAL FIBRILLATION	1	1%

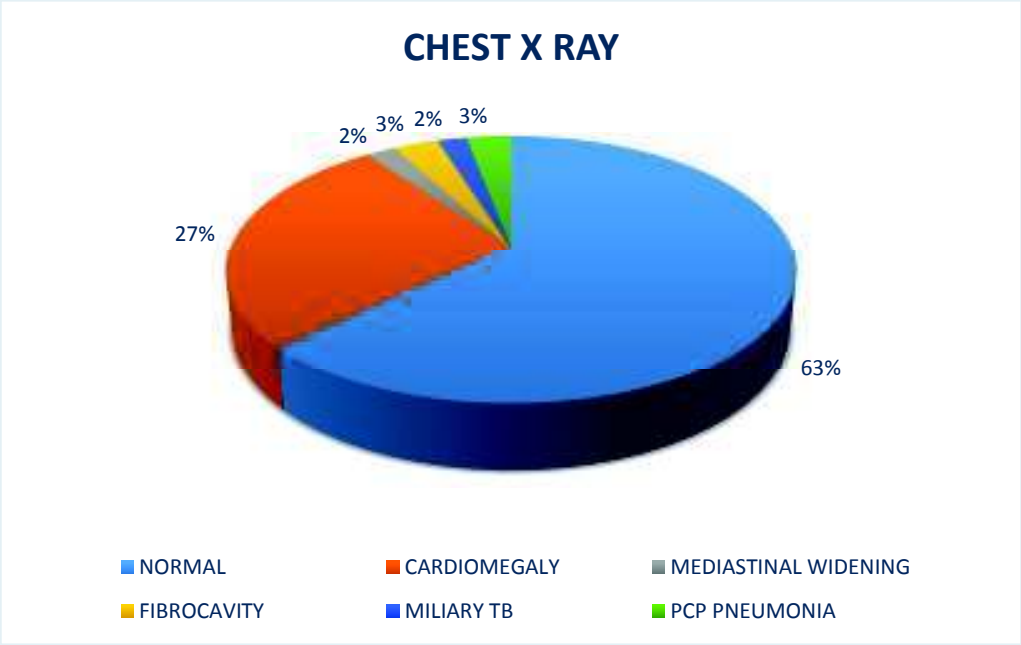
CHART NO.16 – ECG FINDINGS IN 100 PANCYTOPENIA CASES



CHEST X RAY FINDINGS IN 100 PANCYTOPENIA CASES (TABLE-5.14)

CHEST X RAY	NO OF PATIENTS	PERCENTAGE
NORMAL	63	63%
CARDIOMEGALY	27	27%
MEDIASTINAL WIDENING	2	2%
FIBROCAVITY	3	3%
MILIARY TB	2	2%
PCP PNEUMONIA	3	3%

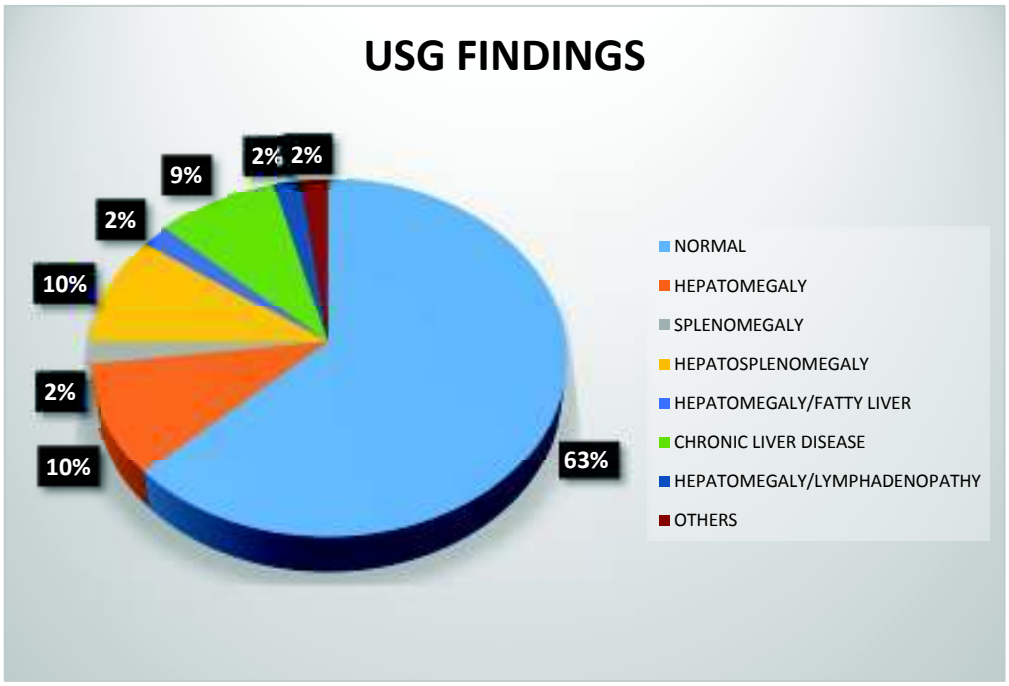
CHART NO.17 – CHEST X RAY FINDINGS IN 100 PANCYTOPENIA CASES



ULTRASOUND ABDOMEN (TABLE-5.15)

USG	NO OF PATIENTS	PERCENTAGE
NORMAL	63	63%
HEPATOMEGALY	10	10%
SPLENOMEGALY	2	2%
HEPATOSPLENOMEGALY	10	10%
HEPATOMEGALY/FATTY LIVER	2	2%
CHRONIC LIVER DISEASE	9	9%
HEPATOMEGALY/LYMPHADENOPATHY	2	2%
OTHERS	2	2%

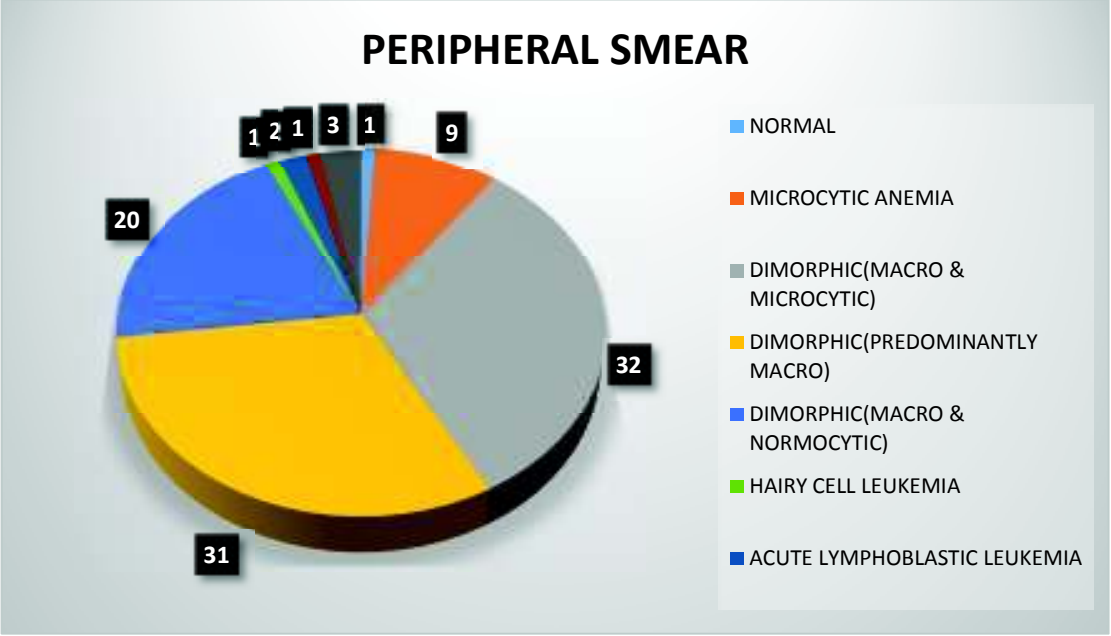
CHART NO.18 – USG FINDINGS IN 100 PANCYTOPENIA CASES



PERIPHERAL SMEAR (TABLE-5.16)

PERIPHERAL SMEAR	NO OF PATIENTS	PERCENTAGE
NORMAL	1	1%
MICROCYTIC ANEMIA	9	9%
DIMORPHIC(MACRO & MICROCYTIC)	32	32%
DIMORPHIC(PREDOMINANTLY MACRO)	31	31%
DIMORPHIC(MACRO & NORMOCYTIC)	20	20%
HAIRY CELL LEUKEMIA	1	1%
ACUTE LYMPHOBLASTIC LEUKEMIA	2	2%
SUB LEUKEMIC LEUKEMIA	1	1%
MALARIA	3	3%

CHART NO.18A – PERIPHERAL SMEAR IN 100 PANCYTOPENIA CASES



BONE MARROW ASPIRATION (TABLE-5.17)

BONE MARROW ASPIRATION	NO OF PATIENTS	PERCENTAGE
NORMAL	11	11%
MEGALOBLASTIC ANEMIA	33	33%
REACTIVE HYPERCELLULAR MARROW	15	15%
MYELODYSPLASTIC SYNDROME	10	10%
APLASTIC ANEMIA	18	18%
MICROERTHROBLASTIC MATURATION	7	7%
MULTIPLE MYELOMA	2	2%
ACUTE LYMPHOBLASTIC LEUKEMIA	2	2%
ACUTE PROMEYELOCYTIC LEUKEMIA	1	1%
HAIRY CELL LEUKEMIA	1	1%

BONE MARROW TREPHINE BIOPSY(TABLE-5.18)

BONE MARROW TREPHINE BIOPSY	NO OF PATIENTS	PERCENTAGE
APLASTIC ANEMIA	18	18%
NOT DONE	82	82%

BONE MARROW CELLULARITY IN 100 PANCYTOPENIA CASES (TABLE-5.19)

BONE MARROW CELLULARITY	NO OF PATIENTS	PERCENTAGE
NOT DONE	10	10%
HYPOCELLULAR	18	18%
HYPERCELLULAR	72	72%

CHART NO. 19 – BONE MARROW CELLULARITY IN 100 PANCYTOPENIA CASES

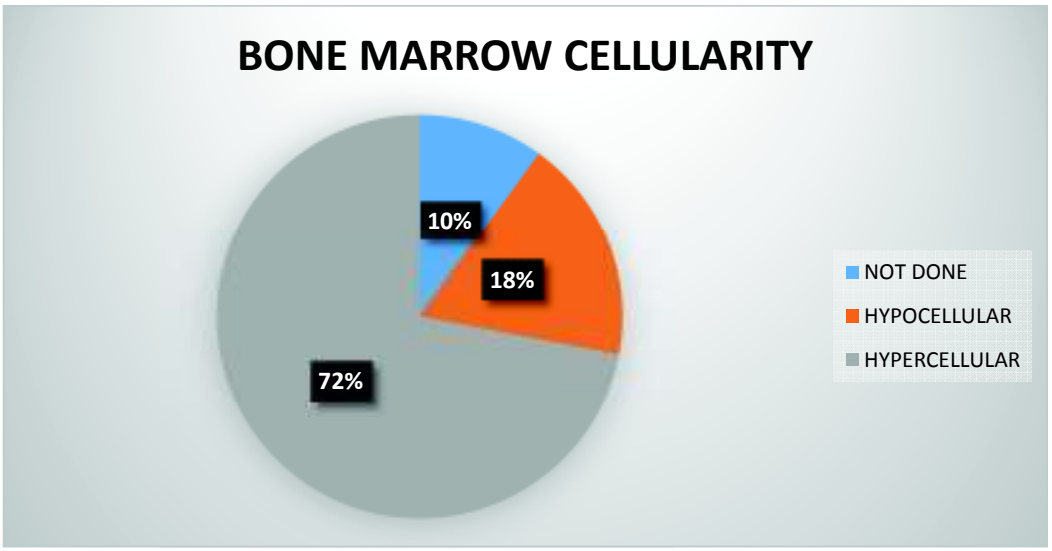


CHART NO. 20 PRIMARY DIAGNOSIS IN 100 PANCYTOPENIA CASES

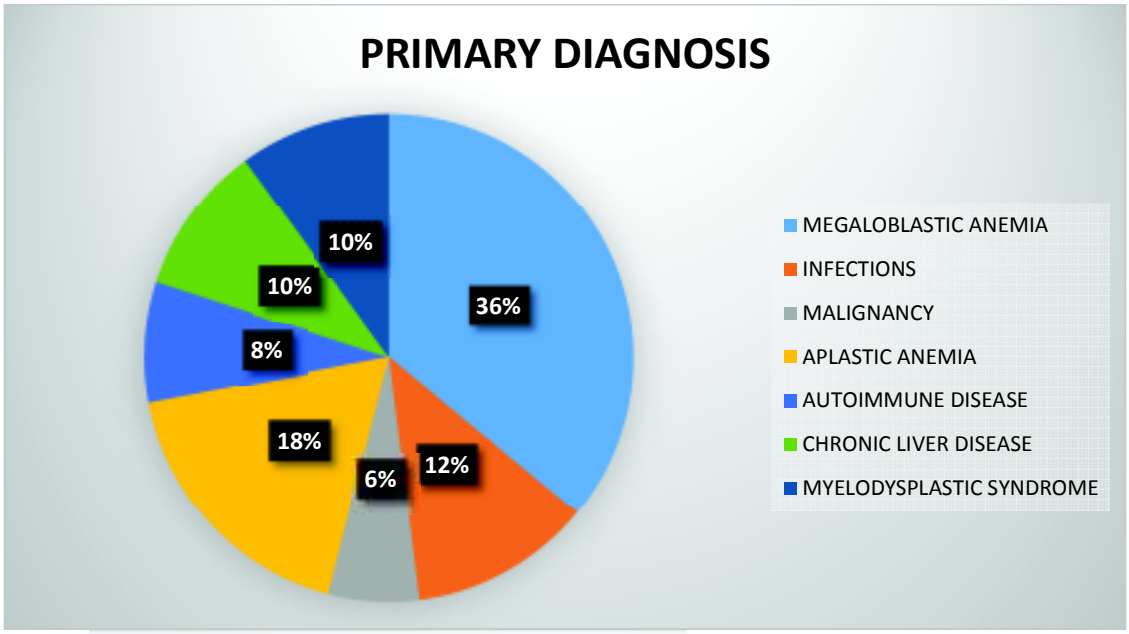


TABLE-5.20 MEAN AGE IN YRS IN 100 PANCYTOPENIA CASES

	MEAN AGE IN YRS	
PRIMARY DIAGNOSIS	**MEAN**	**SD**
MEGALOBLASTIC ANEMIA	32.44	10.29
INFECTIONS	36.17	7.87
MALIGNANCY	43.5	23.39
APLASTIC ANEMIA	64.67	0.48
AUTOIMMUNE DISEASE	29.88	10.84
CHRONIC LIVER DISEASE	46.7	7.24
MYELODYSPLASTIC SYNDROME	64.2	0.919

DIET IN VARIOUS DISEASE CAUSING PANCYTOPENIA (TABLE-5.21)

	DIET	
PRIMARY DIAGNOSIS	**MIXED**	**VEG**
MEGALOBLASTIC ANEMIA	20	16
INFECTIONS	12	0
MALIGNANCY	6	0
APLASTIC ANEMIA	18	0
AUTOIMMUNE DISEASE	8	0
CHRONIC LIVER DISEASE	9	1
MYELODYSPLASTIC SYNDROME	10	0

ALCOHOLISM IN 100 PANCYTOPENIA CASES

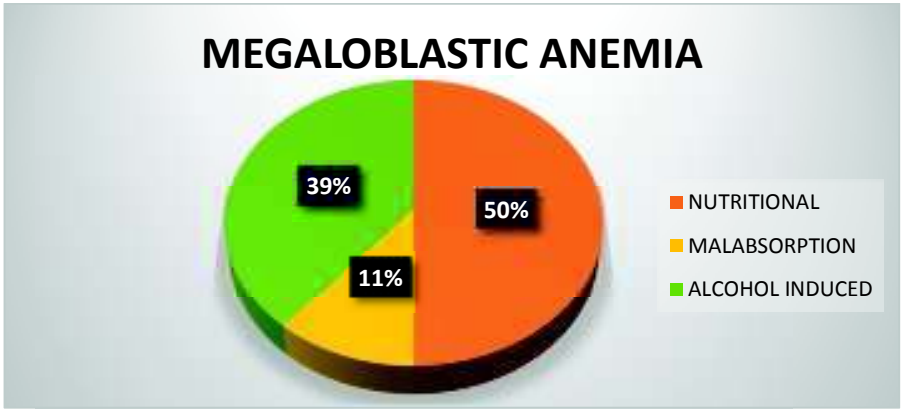
(TABLE-5.22)

	ALCOHOLISM	
PRIMARY DIAGNOSIS	**PRSENT**	**ABSENT**
MEGALOBLASTIC ANEMIA	16	20
INFECTIONS	5	7
MALIGNANCY	1	5
APLASTIC ANEMIA	4	14
AUTOIMMUNE DISEASE	0	8
CHRONIC LIVER DISEASE	9	1
MYELODYSPLASTIC SYNDROME	4	6

1.MEGALOBLASTIC ANEMIA (TABLE-5.23)

MEGALOBLASTIC ANEMIA	NO OF PATIENTS	PERCENTAGE
NUTRITIONAL	18	50%
MALABSORPTION	4	11%
ALCOHOL INDUCED	14	39%

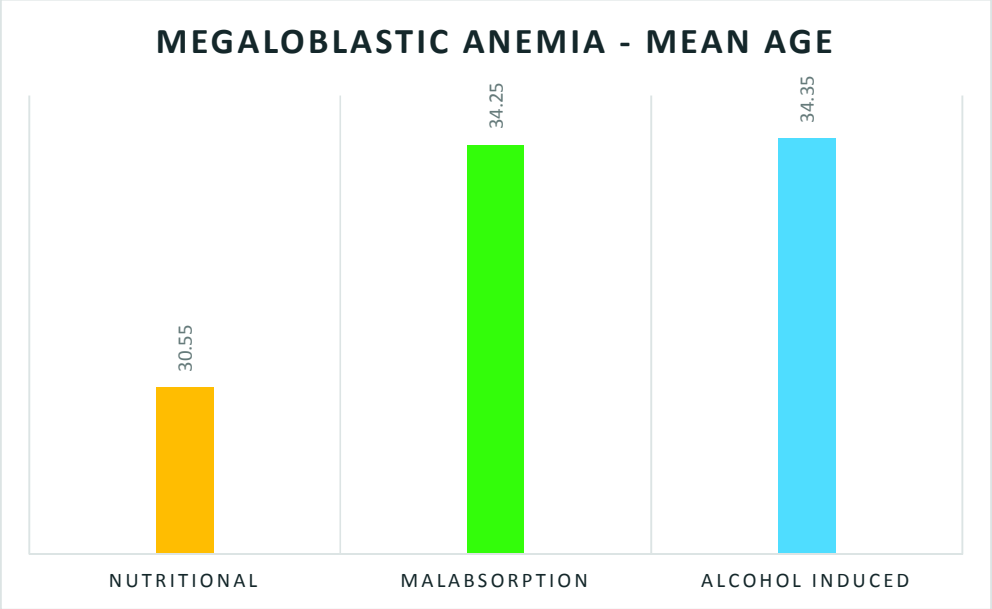
CHART NO.21 ETIOLOGY OF MEGALOBLASTIC ANEMIA IN 100 PANCYTOPENIA CASES



MEAN AGE IN MEGALOBLASTIC ANEMIA (TABLE -5.24)

MEGALOBLASTIC ANEMIA	AGE IN YRS	
	MEAN	SD
NUTRITIONAL	30.55	11.46
MALABSORPTION	34.25	11.47
ALCOHOL INDUCED	34.35	10.26

CHART NO. 22 – MEGALOBLASTIC ANEMIA – MEAN AGE



CBC IN MEGALOBLASTIC ANEMIA (TABLE-5.25)

	MEAN		
MEGALOBLASTIC ANEMIA	HB% IN GMS	TOTAL COUNT	PLATELET COUNT
NUTRITIONAL	6.260	2981.00	29772.00
MALABSORPTION	7.370	2395.00	76500.00
ALCOHOL INDUCED	5.260	3264.00	37142.00

MCV, ESR, RETIC. COUNT IN MEGALOBLASTIC ANEMIA (TABLE-5.26)

MEGALOBLASTIC ANEMIA	MCV	ESR	RETI COUNT
NUTRITIONAL	110.370	22.22	0.86
MALABSORPTION	106.250	64.00	1.90
ALCOHOL INDUCED	110.500	29.50	1.38

MEAN LDH, RFT IN MEGALOBLASTIC ANEMIA (TABLE-5.27)

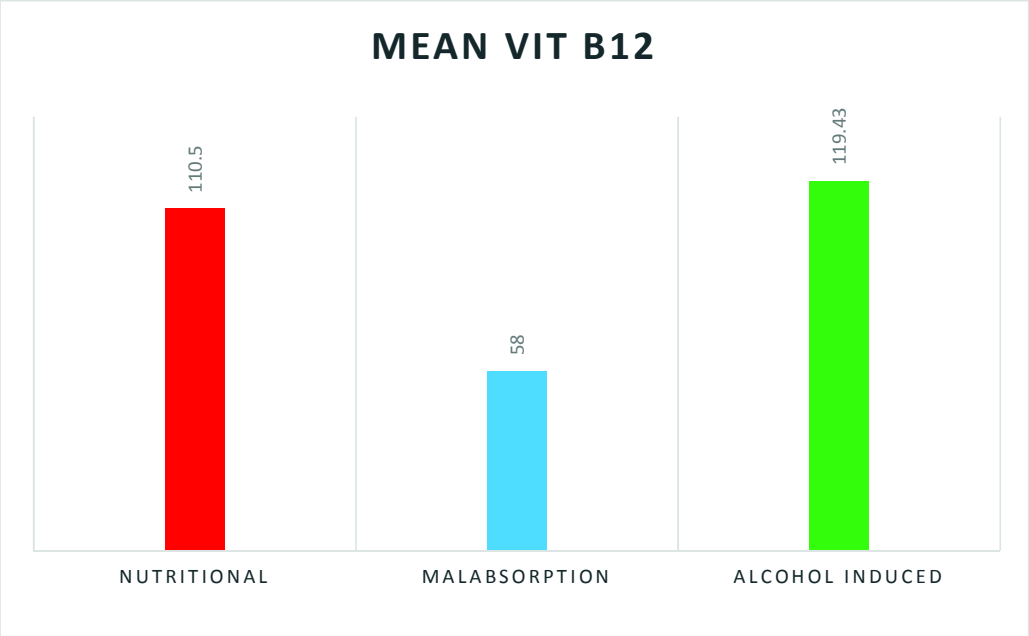
	MEAN		
MEGALOBLASTIC ANEMIA	**LDH**	**UREA**	**CREATININE**
NUTRITIONAL	207.780	25.67	0.57
MALABSORPTION	2323.750	28.75	0.57
ALCOHOL INDUCED	380.710	37.36	0.85

LFT IN MEGALOBLASTIC ANEMIA (TABLE-5.28)

MEGALOBLASTIC ANEMIA	TOTAL BILIRUBIN	SGOT	SGPT
NUTRITIONAL	0.900	30.220	25.22
MALABSORPTION	1.220	45.500	41.25
ALCOHOL INDUCED	1.580	53.210	53.21

MEAN VIT. B12 LEVEL IN MEGALOBLASTIC ANEMIA

(CHART NO.23)

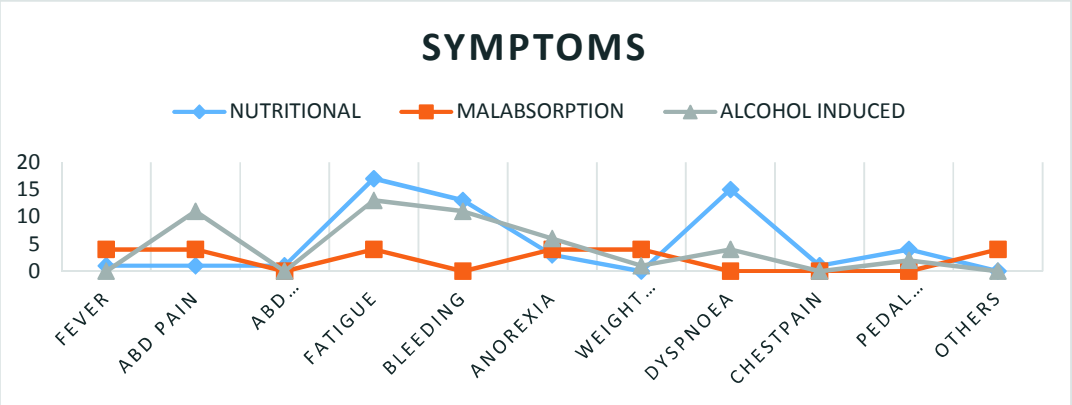


SYMPTOMS IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA

(TABLE-5.29)

SYMPTOMS	NUTRITIONAL	MALABSORPTION	ALCOHOL INDUCED
FEVER	1	4	0
ABD PAIN	1	4	11
ABD.DIS	1	0	0
FATIGUE	17	4	13
BLEEDING	13	0	11
ANOREXIA	3	4	6
WEIGHT LOSS	0	4	1
DYSPNOEA	15	0	4
CHESTPAIN	1	0	0
PEDAL EDEMA	4	0	2
OTHERS	0	4	0

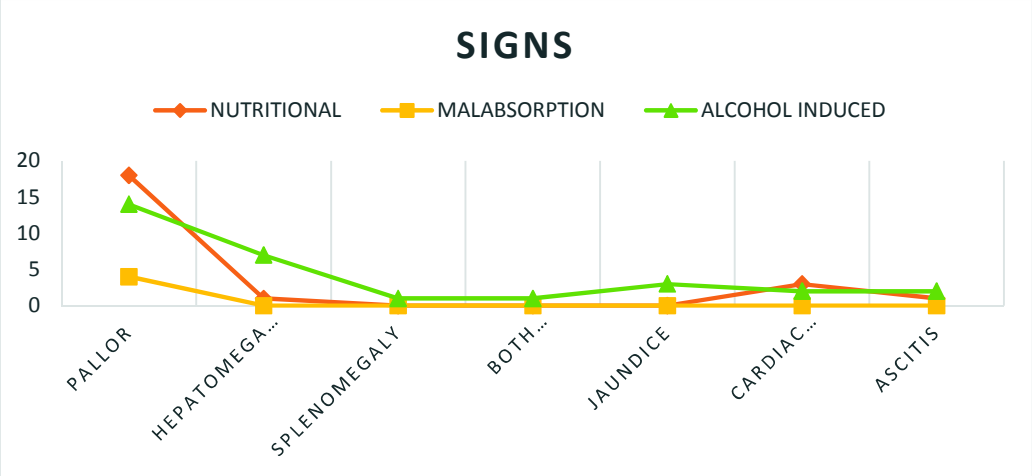
CHART NO.24 - SYMPTOMS IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA



SIGNS IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA (TABLE5.30)

SIGNS	NUTRITIONAL	MALABSORPTION	ALCOHOL INDUCED
PALLOR	18	4	14
HEPATOMEGALY	1	0	7
SPLENOMEGALY	0	0	1
BOTH (HEP+SPL)	0	0	1
JAUNDICE	0	0	3
CARDIAC FAILURE	3	0	2
ASCITIS	1	0	2

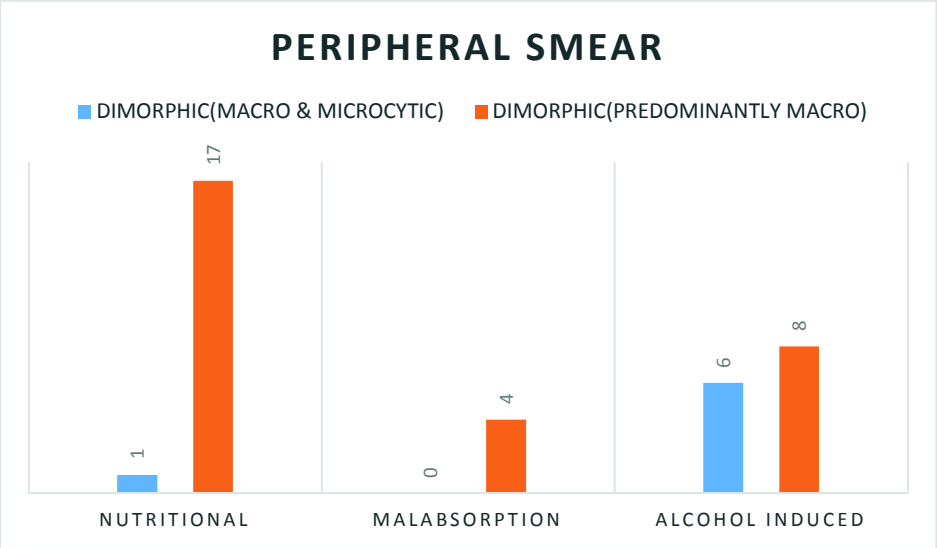
CHART NO.25- SIGNS IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA



PERIPHERAL SMEAR IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA (TABLE -5.31)

PERIPHERAL SMEAR	NUTRITIONAL	MALABSORPTION	ALCOHOL INDUCED
DIMORPHIC(MACRO & MICROCYTIC)	1	0	6
DIMORPHIC (PREDOMINANTLY MACRO)	17	4	8

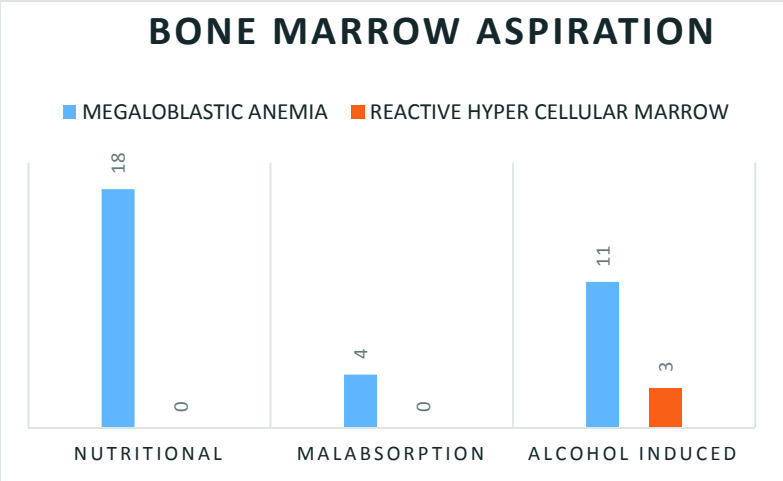
CHART NO. 26 - PERIPHERAL SMEAR IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA



BONE MARROW ASPIRATION IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA (TABLE NO. 32)

BONE MARROW ASPIRATION	NUTRITIONAL	MALABSORPTION	ALCOHOL INDUCED
MEGALOBLASTIC ANEMIA	18	4	11
REACTIVE HYPERCELLULAR MARROW	0	0	3

CHART NO.27 - BONE MARROW ASPIRATION IN DIFFERENT CAUSES OF MEGALOBLASTIC ANEMIA



2. APLASTIC ANEMIA(TABLE-5.33)

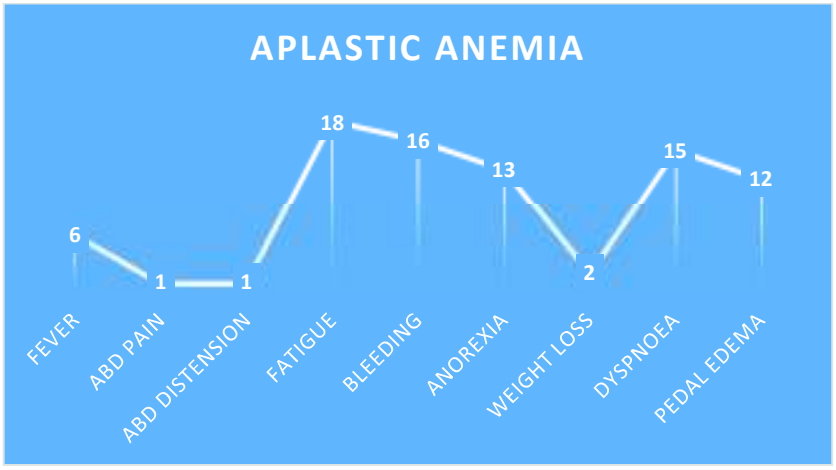
HEMATOLOGICAL PARAMETERS IN APLASTIC ANEMIA

APLASTIC ANEMIA	MEAN
HAEMOGLOBIN	3.46
TOTAL COUNT	2092.22
PLATELET COUNT	15722.22
MCV	82.48
ESR	24.94
RETICULOCYTE COUNT	0.56
LDH	97.89
UREA	39.06
CREATININE	1.04
TOTAL BILIRUBIN	0.95
SGOT	32.88
SGPT	28.83
VITAMIN B12	379.16

SYMPTOMS IN APLASTIC ANEMIA (TABLE-5.34)

SYMPTOMS	APLASTIC ANEMIA
FEVER	6
ABD PAIN	1
ABD DISTENSION	1
FATIGUE	18
BLEEDING	16
ANOREXIA	13
WEIGHT LOSS	2
DYSPNOEA	15
PEDAL EDEMA	12

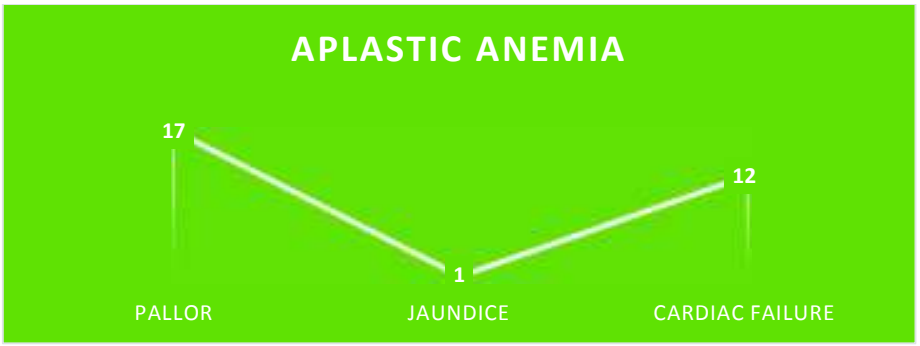
CHART NO.28 - SYMPTOMS IN APLASTIC ANEMIA



SIGNS IN APLASTIC ANEMIA (TABLE NO.5.35)

SIGNS	APLASTIC ANEMIA
PALLOR	17
JAUNDICE	1
CARDIAC FAILURE	12

CHART NO.29 - SIGNS IN APLASTIC ANEMIA



PERIPHERAL SMEAR IN APLASTIC ANEMIA (TABLE-5-36)

PERIPHERAL SMEAR	APLASTIC ANEMIA
MICROCYTIC ANEMIA	4
DIMORPHIC(MACRO & NORMOCYTIC)	14

BONE MARROW ASPIRATION	APLASTIC ANEMIA
DRY TAP	18

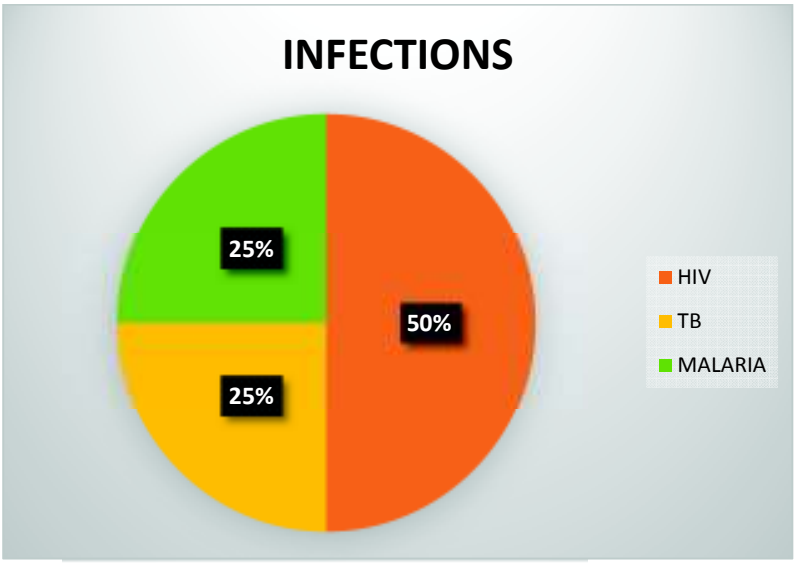
BONE MARROW ASPIRATION IN APLASTIC ANEMIA (TABLE -5.37)

Bone Marrow Trephine Biopsy	No of Patients
Aplastic Anemia	18

3. INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.38)

INFECTIONS	NO OF PATIENTS	PERCENTAGE
HIV	6	50%
TB	3	25%
MALARIA	3	25%

CHART NO.30 - INFECTIONS CAUSING PANCYTOPENIA



HAEMOGRAM IN INFECTIONS CAUSING PANCYTOPENIA

(TABLE- 5.39)

	MEAN		
INFECTIONS	HB% IN GMS	TOTAL COUNT	PLATELET COUNT
HIV	6.500	2650.00	29420.00
TB	6.160	3053.00	63433.00
MALARIA	8.060	3183.00	35333.00

MEAN MCV, ESR, RETIC.COUNT IN INFECTIONS CAUSING PANCYTOPENIA (TABLE – 5.40)

	MEAN		
INFECTIONS	**MCV**	**ESR**	**RETIC.COUNT**
HIV	104.330	94.00	0.77
TB	79.330	84.67	0.70
MALARIA	82.330	73.67	1.10

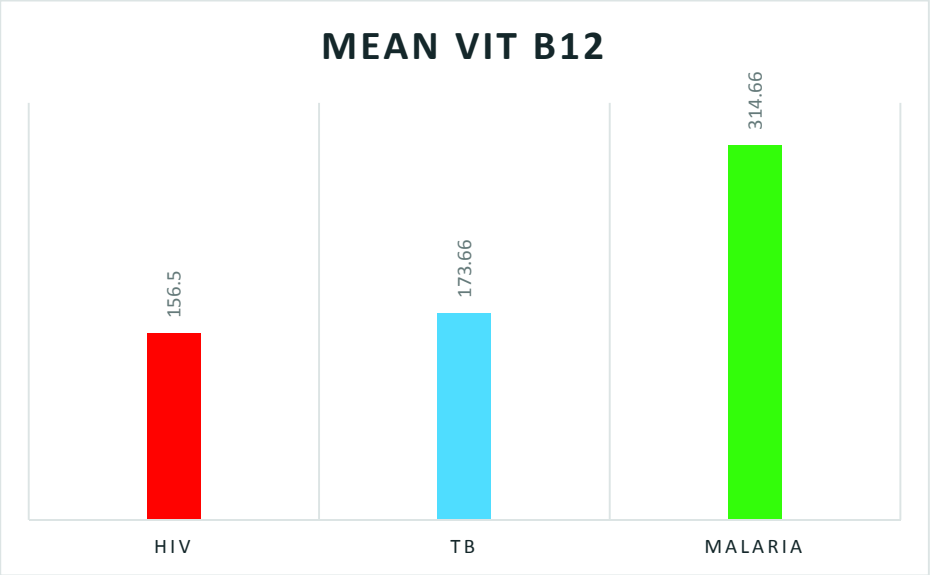
MEAN LDH & RFT IN INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.41)

INFECTIONS	LDH	UREA	CREATININE
HIV	128.330	37.33	0.92
TB	101.330	30.33	0.87
MALARIA	103.000	67.33	1.90

LIVER FUNCTION TEST IN INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.42)

INFECTIONS	TOTAL BILIRUBIN	SGOT	SGPT
HIV	0.930	46.670	35.00
TB	0..86	27.670	25.33
MALARIA	3.760	283.330	275.33

CHART NO.31 MEAN VIT. B12 LEVELS IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA

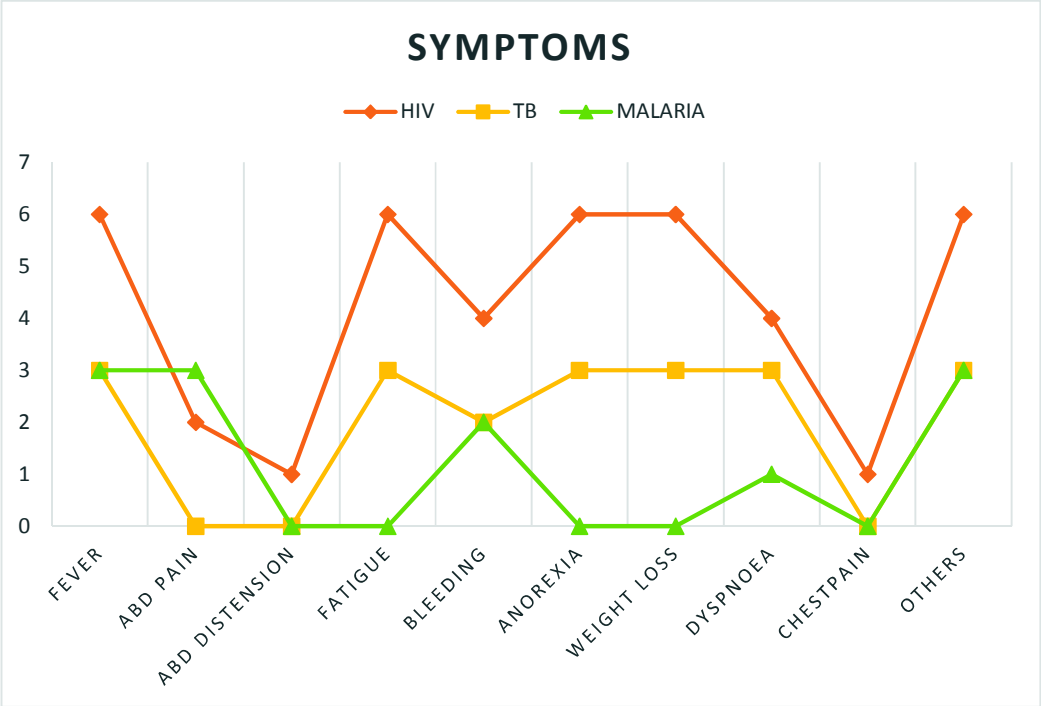


SYMPTOMS IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA

(TABLE-5.43)

SYMPTOMS	HIV	TB	MALARIA
FEVER	6	3	3
ABD PAIN	2	0	3
ABD DISTENSION	1	0	0
FATIGUE	6	3	0
BLEEDING	4	2	2
ANOREXIA	6	3	0
WEIGHT LOSS	6	3	0
DYSPNOEA	4	3	1
CHESTPAIN	1	0	0
OTHERS	6	3	3

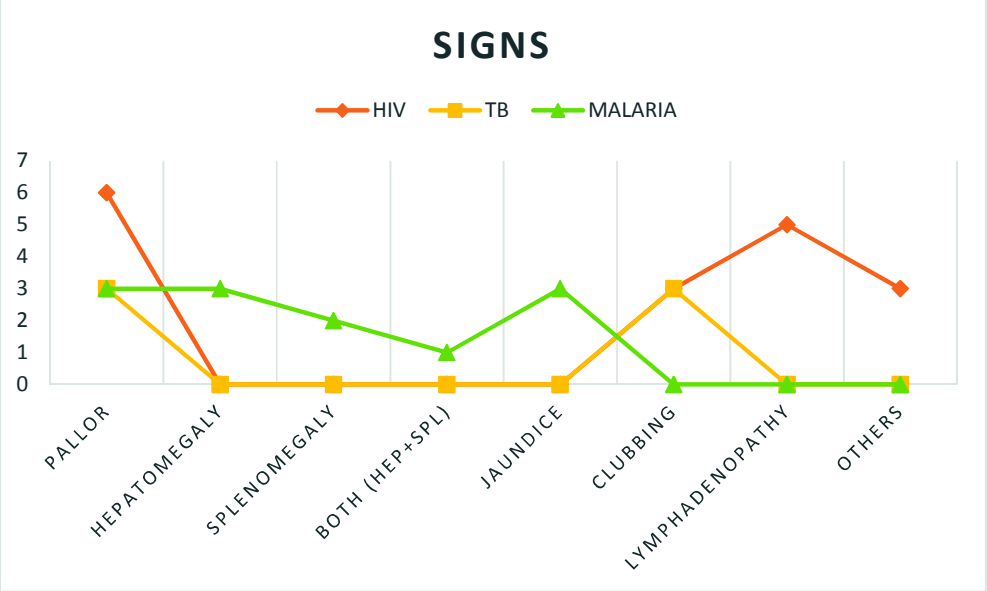
CHART NO.32 SYMPTOMS IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA



SIGNS IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.44)

SIGNS	HIV	TB	MALARIA
PALLOR	6	3	3
HEPATOMEGALY	0	0	3
SPLENOMEGALY	0	0	2
BOTH (HEP+SPL)	0	0	1
JAUNDICE	0	0	3
CLUBBING	3	3	0
LYMPHADENOPATHY	5	0	0
OTHERS	3	0	0

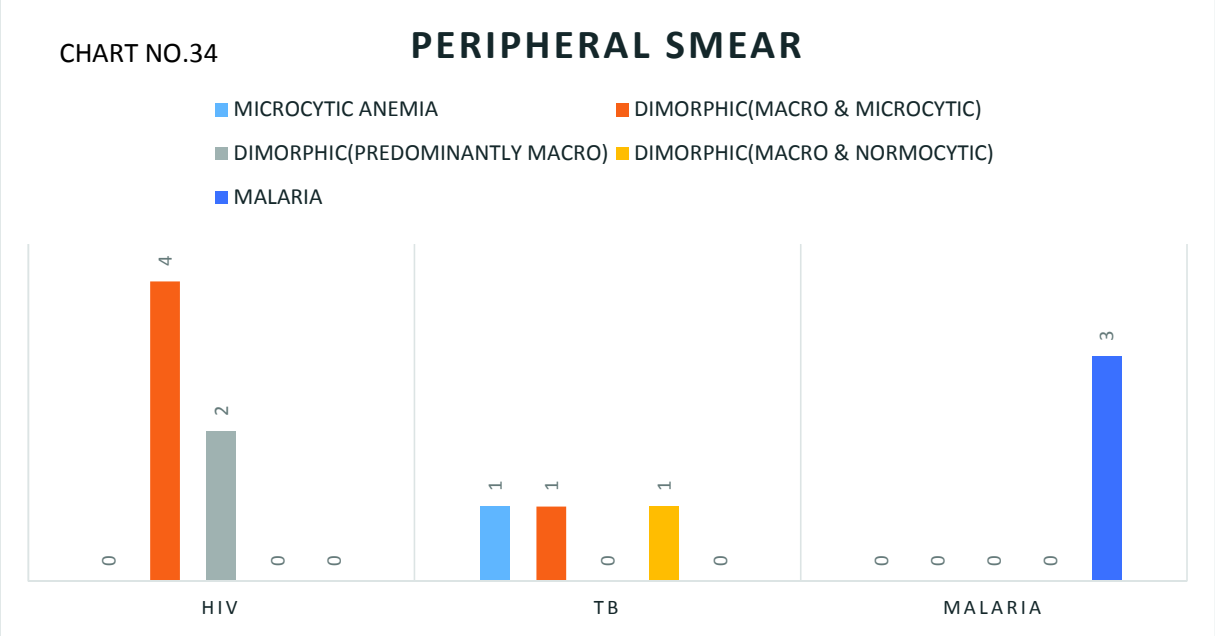
CHART NO.33 - SIGNS IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA



PERIPHERAL SMEAR IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.45)

PERIPHERAL SMEAR	HIV	TB	MALARIA
MICROCYTIC ANEMIA	0	1	0
DIMORPHIC(MACRO & MICROCYTIC)	4	1	0
DIMORPHIC(PREDOMINANTLY MACRO)	2	0	0
DIMORPHIC(MACRO & NORMOCYTIC)	0	1	0
MALARIA	0	0	3

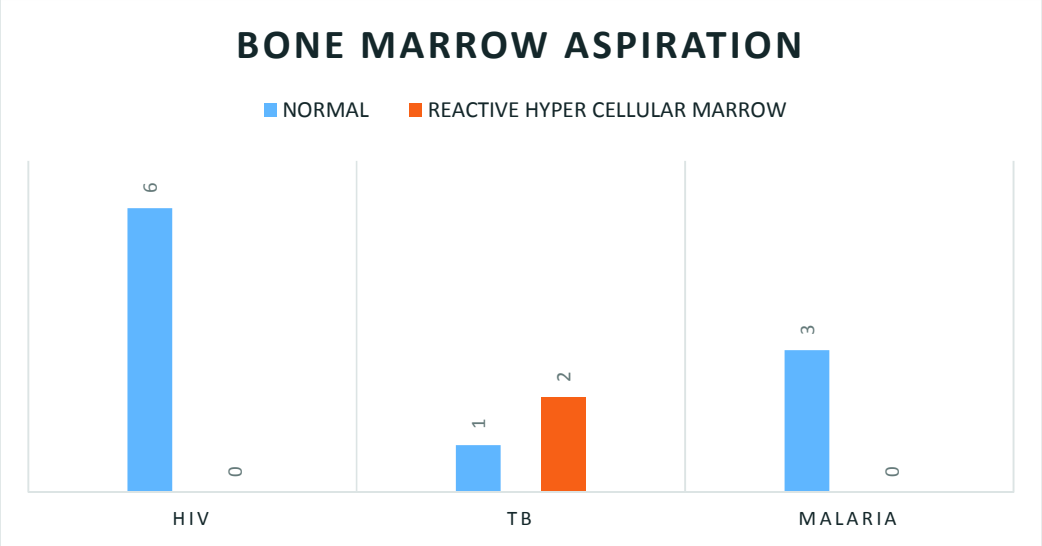
CHART NO.34 - PERIPHERAL SMEAR IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA



BONE MARROW ASPIRATION PERIPHERAL SMEAR IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA (TABLE-5.46)

BONE MARROW ASPIRATION	HIV	TB	MALARIA
NORMAL	6	1	3
REACTIVE HYPER CELLULAR MARROW	0	2	0

CHART NO.35- BONE MARROW ASPIRATION PERIPHERAL SMEAR IN VARIOUS INFECTIONS CAUSING PANCYTOPENIA



4. MYELODYSPLASTIC SYNDROME

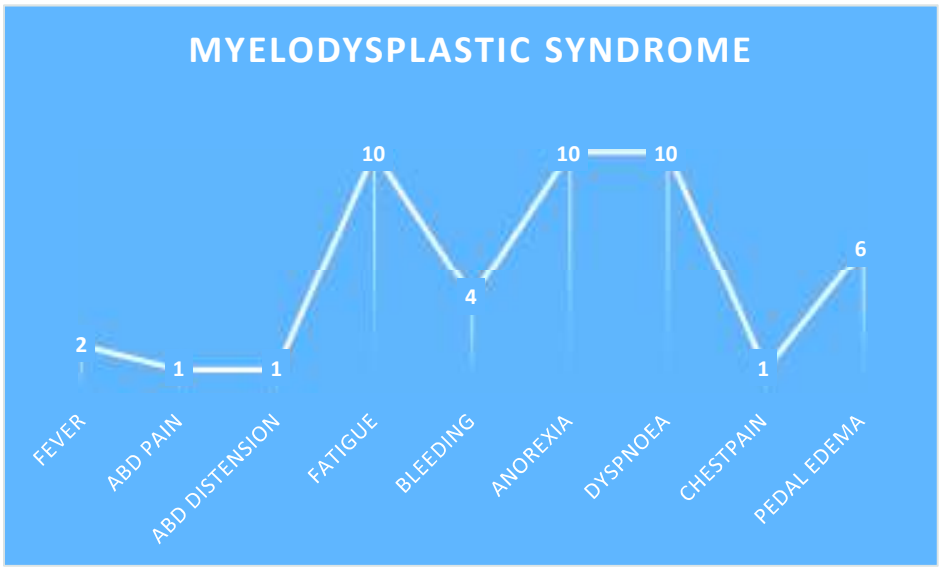
HEMATOLOGICAL PARAMETERS IN MDS (TABLE-5.47)

MYELODYSPLASTIC SYNDROME	MEAN
HAEMOGLOBIN	4.14
TOTAL COUNT	3203
PLATELET COUNT	49790
MCV	110.4
ESR	47.3
RETICULOCYTE COUNT	0.75
LDH	205.9
UREA	42.3
CREATININE	1.05
TOTAL BILIRUBIN	1.24
SGOT	41.3
SGPT	35.9
VITAMIN B12	174.5

SYMPTOMS IN MDS (TABLE-5.48)

SYMPTOMS	MYELODYSPLASTIC SYNDROME
FEVER	2
ABD PAIN	1
ABD DISTENSION	1
FATIGUE	10
BLEEDING	4
ANOREXIA	10
DYSPNOEA	10
CHESTPAIN	1
PEDAL EDEMA	6

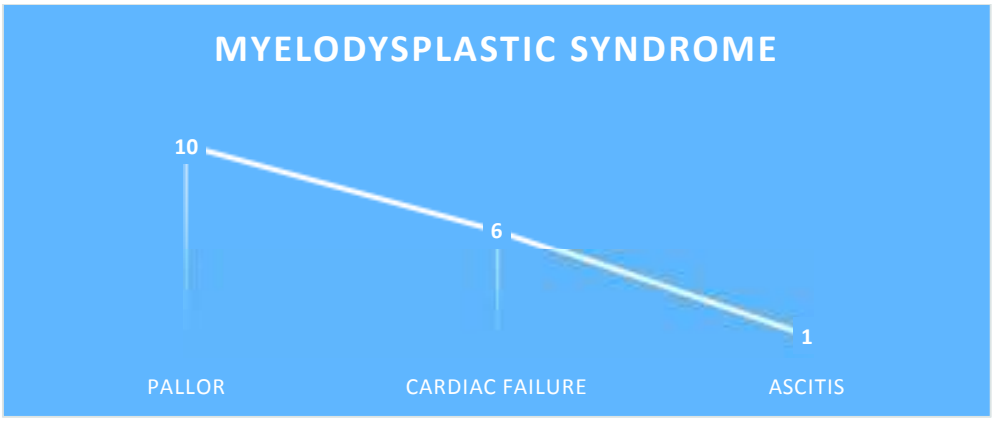
CHART NO.36 - SYMPTOMS IN MDS



SIGNS IN MDS TABLE-5.49

SIGNS	MYELODYSPLASTIC SYNDROME
PALLOR	10
CARDIAC FAILURE	6
ASCITIS	1

SIGNS IN MDS (CHART NO 37)



PERIPHERAL SMEAR IN MDS TABLE-5.50

PERIPHERAL SMEAR	MYELODYSPLASTIC SYNDROME
DIMORPHIC(MACRO & MICROCYTIC)	10

BONE MARROW ASPIRATION IN MDS TABLE-5.51

BONE MARROW ASPIRATION	MYELODYSPLASTIC SYNDROME
MYELODYSPLASTIC SYNDROME	10

5. CHRONIC LIVER DISEASE

HEMATOLOGICAL PARAMETERS IN CHRONIC LIVER DISEASE (TABLE-5.52)

CHRONIC LIVER DISEASE	MEAN
HAEMOGLOBIN	6.6
TOTAL COUNT	3033
PLATELET COUNT	51852
MCV	105.7
ESR	39.2
RETICULOCYTE COUNT	1.08
LDH	235
UREA	37.2
CREATININE	0.86
TOTAL BILIRUBIN	4.35
SGOT	227.8
SGPT	100.3
TOTAL PROTEIN	5.27
ALBUMIN	2.25
GLOBULIN	2.92
VITAMIN B12	317

VARIOUS SYMPTOMS IN CHRONIC LIVER DISEASE (TABLE-5.53)

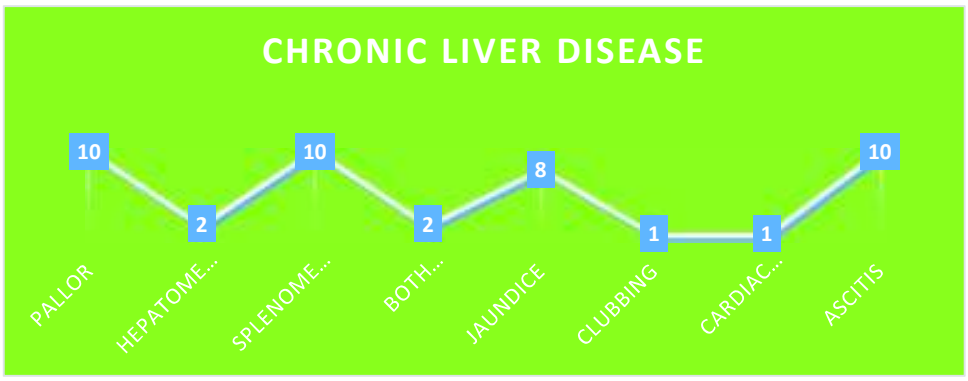
SYMPTOMS	CHRONIC LIVER DISEASE
FEVER	1
ABD PAIN	6
ABD DISTENSION	8
FATIGUE	5
BLEEDING	9
ANOREXIA	9
WEIGHT LOSS	5
ABD MASS	3
DYSPNOEA	6
PEDAL EDEMA	9

CHART NO.38 - SYMPTOMS IN CHRONIC LIVER DISEASE

VARIOUS SIGNS IN CHRONIC LIVER DISEASE (TABLE-5.54)

SIGNS	CHRONIC LIVER DISEASE
PALLOR	10
HEPATOMEGALY	2
SPLENOMEGALY	10
BOTH (HEP+SPL)	2
JAUNDICE	8
CLUBBING	1
CARDIAC FAILURE	1
ASCITIS	10

CHART NO. 39 - VARIOUS SIGNS IN CHRONIC LIVER DISEASE



PERIPHERAL SMEAR IN CHRONIC LIVER DISEASE (TABLE-5.55)

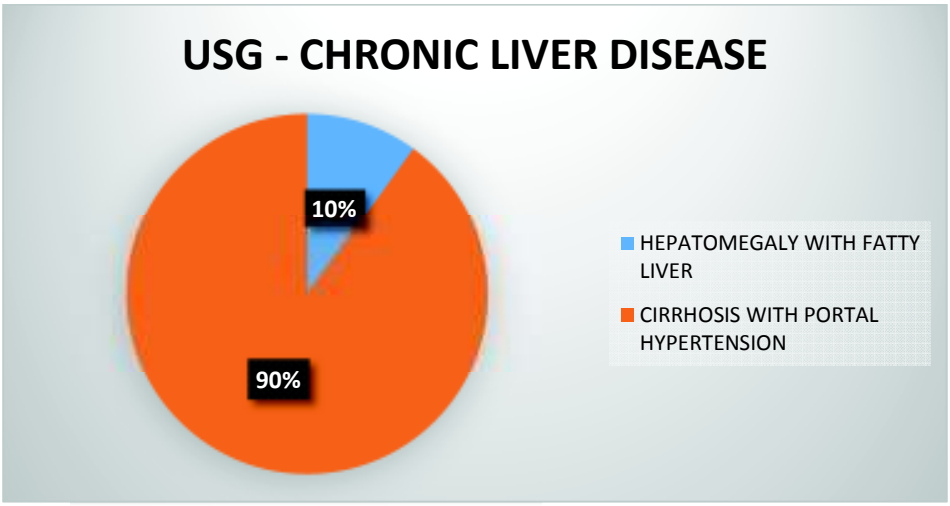
PERIPHERAL SMEAR	CHRONIC LIVER DISEASE
DIMORPHIC(MACRO & MICROCYTIC)	10

BONE MARROW ASPIRATION IN CHRONIC LIVER DISEASE

(TABLE- 5.56)

BONE MARROW ASPIRATION	CHRONIC LIVER DISEASE
NORMAL	1
REACTIVE HYPER CELLULAR MARROW	9

CHART NO 40 - USG FINDINGS IN CLD



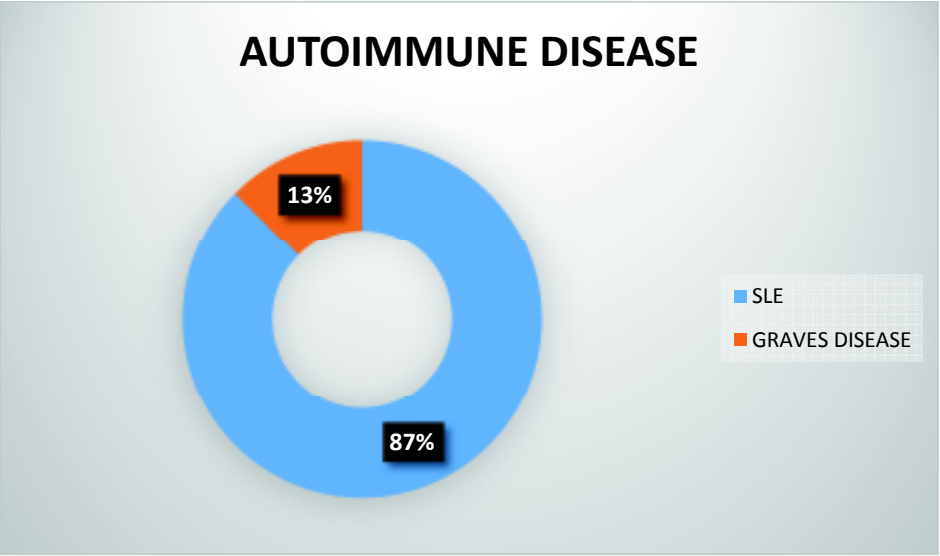
6. AUTOIMMUNE DISEASE

VARIOUS AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA

(TABLE-5.57)

AUTOIMMUNE DISEASE	NO OF PATIENTS	PERCENTAGE
SLE	7	87%
GRAVES DISEASE	1	13%

CHART NO. 41 - VARIOUS AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA



CBC IN AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA (TABLE-5.58)

	MEAN		
AUTOIMMUNE DISEASE	HB%	TC	PLATELET COUNT
SLE	7.700	3164.00	29885.00
GRAVES DISEASE	8.900	2800.00	42000.00

MEAN MCV, ESR, RETIC COUNT IN AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA (TABLE- 5.59)

	MEAN		
AUTOIMMUNE DISEASE	**MCV**	**ESR**	**RETIC COUNT**
SLE	85.290	68.43	1.00
GRAVES DISEASE	88.000	48.00	1.40

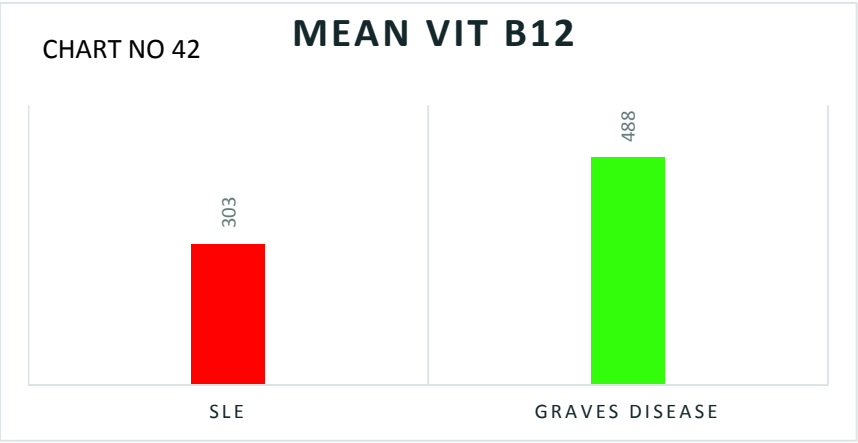
MEAN LDH & RFT IN AUTOIMMUNE DISEASES (TABLE - 5.60)

AUTOIMMUNE DISEASE	LDH	UREA	CREATININE
SLE	242.140	39.86	0.73
GRAVES DISEASE	474.000	18.00	0.70

LFT IN AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA (TABLE - 5.61)

AUTOIMMUNE DISEASE	TOTAL BILIRUBIN	SGOT	SGPT
SLE	0.957	92.000	96.14
GRAVES DISEASE	4.900	25.000	28.00

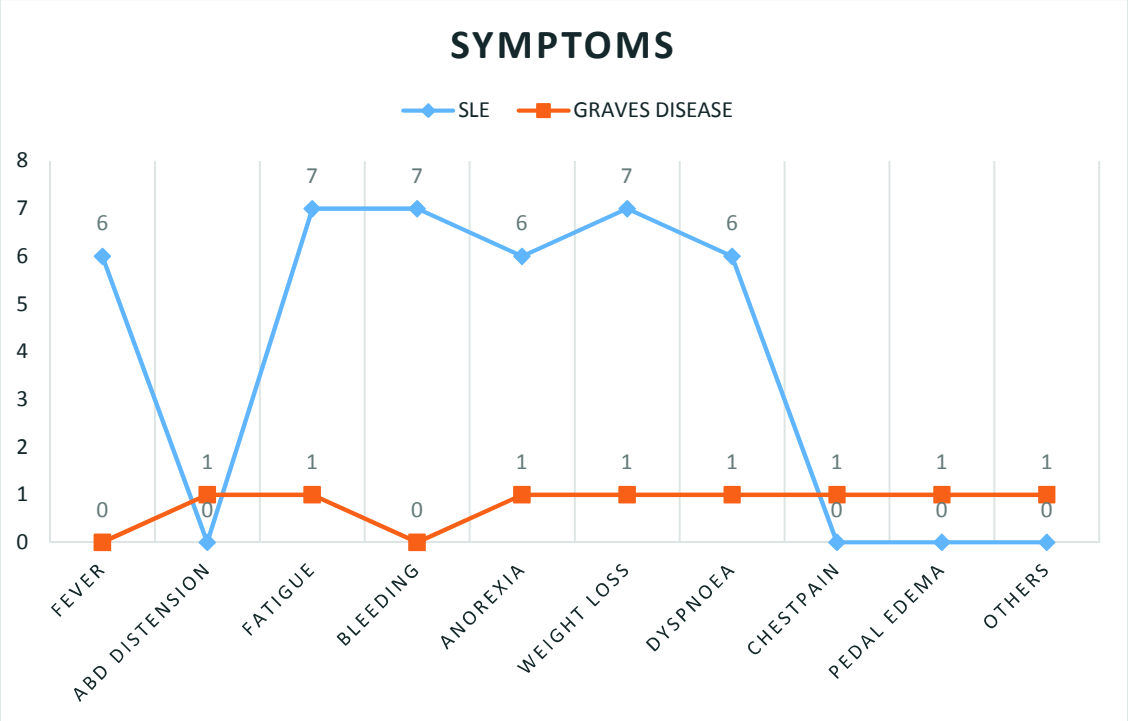
CHART NO. 42 - MEAN VIT B12 IN AUTOIMMUNE DISEASE CAUSING PANCYTOPENIA



SYMPTOMS IN AUTOIMMUNE DISEASE (TABLE- 5.62)

SYMPTOMS	SLE	GRAVES DISEASE
FEVER	6	0
ABD DISTENSION	0	1
FATIGUE	7	1
BLEEDING	7	0
ANOREXIA	6	1
WEIGHT LOSS	7	1
DYSPNOEA	6	1
CHESTPAIN	0	1
PEDAL EDEMA	0	1
OTHERS	0	1

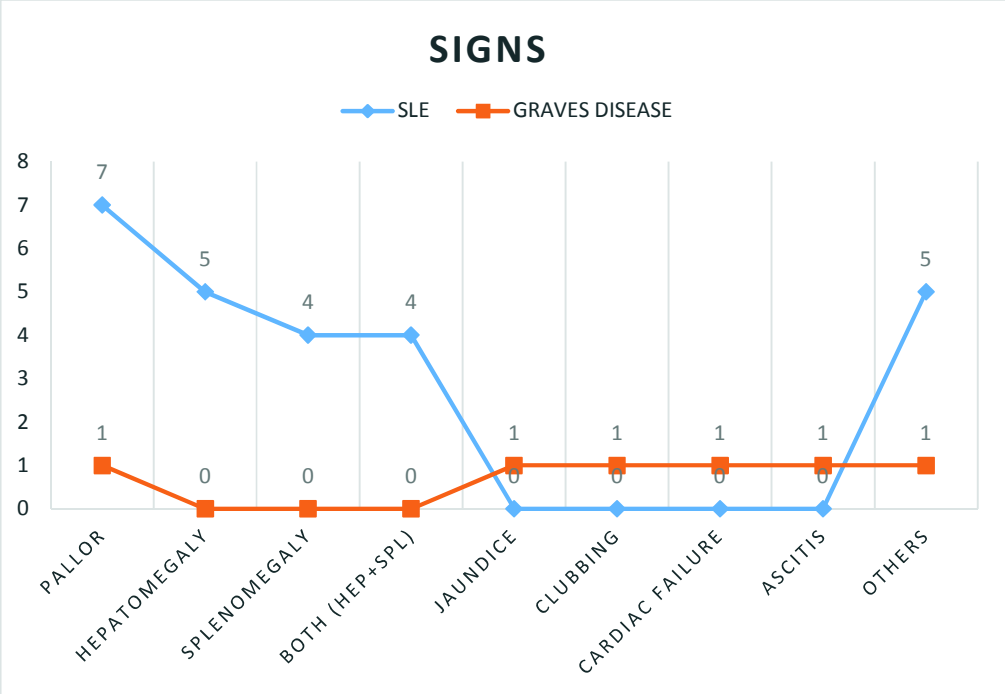
CHART NO. 43- SYMPTOMS IN AUTOIMMUNE DISEASE



SIGNS IN AUTOIMMUNE DISEASE (TABLE-5.63)

SIGNS	SLE	GRAVES DISEASE
PALLOR	7	1
HEPATOMEGALY	5	0
SPLENOMEGALY	4	0
BOTH (HEP+SPL)	4	0
JAUNDICE	0	1
CLUBBING	0	1
CARDIAC FAILURE	0	1
ASCITIS	0	1
OTHERS	5	1

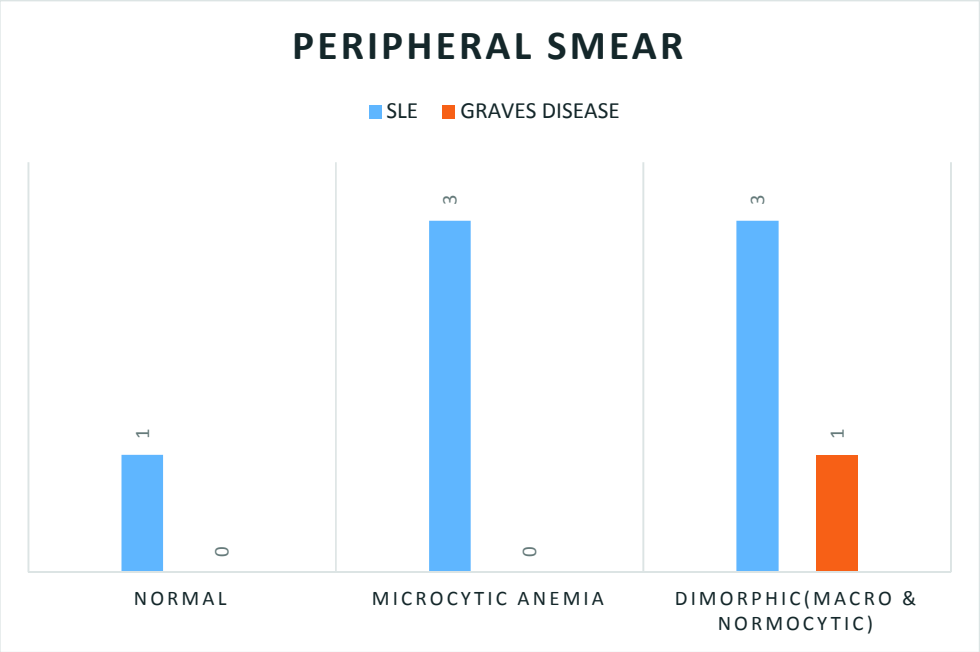
CHART NO.44 - SIGNS IN AUTOIMMUNE DISEASE



PERIPHERAL SMEAR IN AUTOIMMUNE DISEASE (TABLE-5.64)

PERIPHERAL SMEAR	SLE	GRAVES DISEASE
NORMAL	1	0
MICROCYTIC ANEMIA	3	0
DIMORPHIC(MACRO & NORMOCYTIC)	3	1

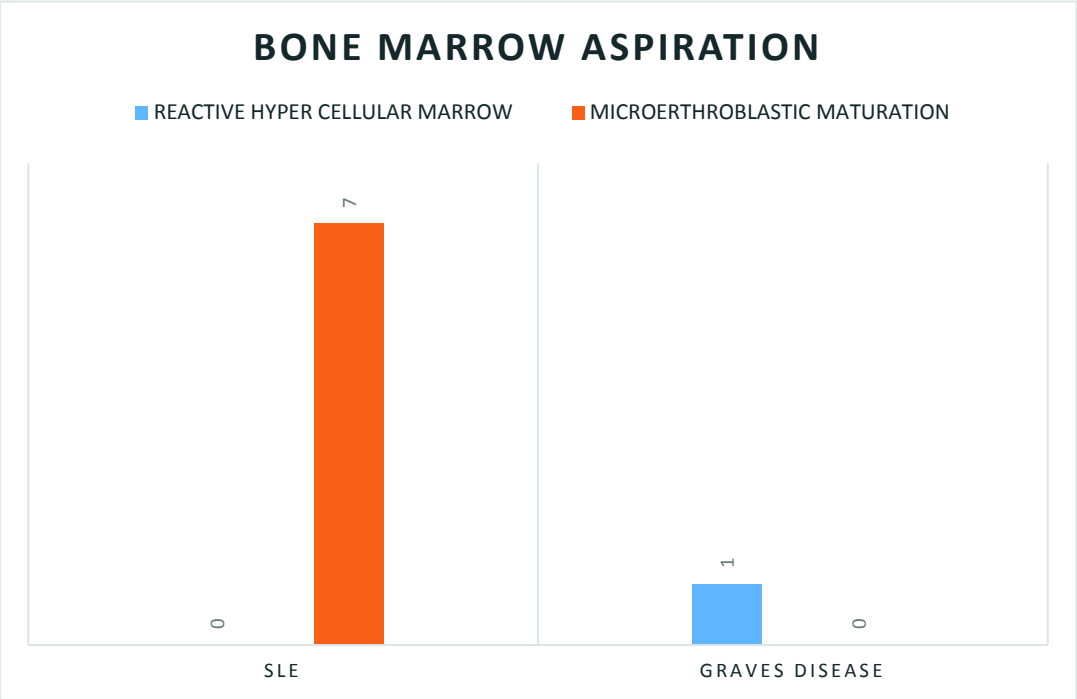
CHART NO. 45 - PERIPHERAL SMEAR IN AUTOIMMUNE DISEASE



BONE MARROW ASPIRATION IN AUTOIMMUNE DISEASE (TABLE-5.65)

BONE MARROW ASPIRATION	SLE	GRAVES DISEASE
REACTIVE HYPER CELLULAR MARROW	0	1
MICROERTHROBLASTIC MATURATION	7	0

CHART NO. 46 - BONE MARROW ASPIRATION IN AUTOIMMUNE DISEASE

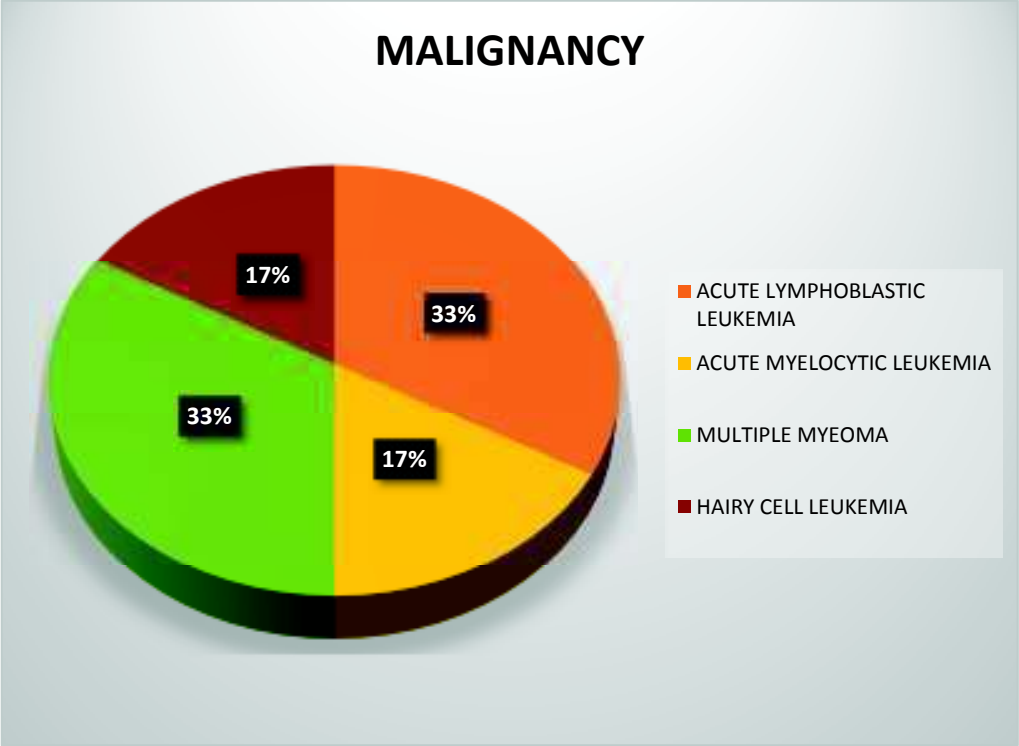


7. HEMATOLOGICAL MALIGNANCIES CAUSING PANCYTOPENIA

(TABLE-5.66)

MALIGNANCY	NO OF PATIENTS	PERCENTAGE
ACUTE LYMPHOBLASTIC LEUKEMIA	2	33%
ACUTE MYELOCYTIC LEUKEMIA	1	17%
MULTIPLE MYEOMA	2	33%
HAIRY CELL LEUKEMIA	1	17%

CHART NO.47 – VARIOUS HEMATOLOGICAL MALIGNANCIES CAUSING PANCYTOPENIA

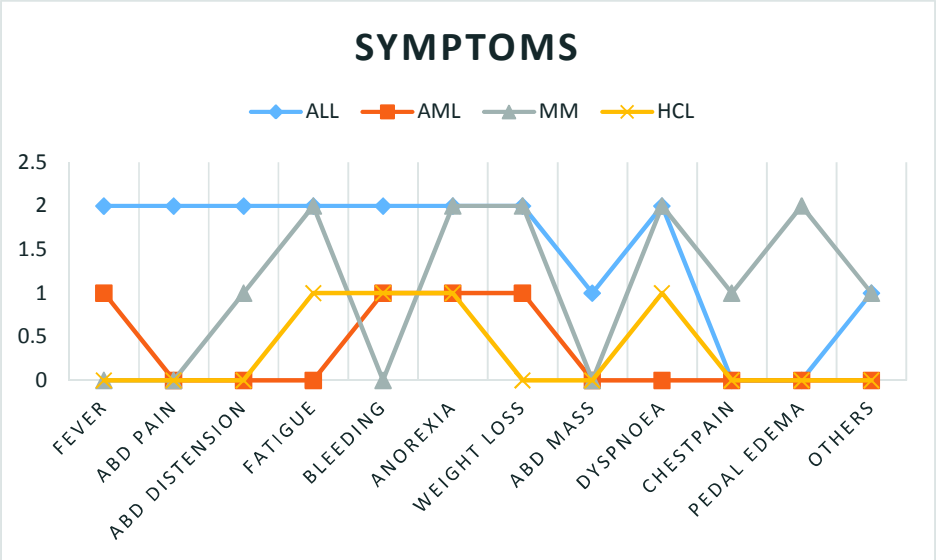


SYMPTOMS IN HEMATOLOGICAL MALIGNANCIES (TABLE 5.67)

SYMPTOMS	ALL	AML	MM	HCL
FEVER	2	1	0	0
ABD PAIN	2	0	0	0
ABD DISTENSION	2	0	1	0
FATIGUE	2	0	2	1
BLEEDING	2	1	0	1
ANOREXIA	2	1	2	1
WEIGHT LOSS	2	1	2	0
ABD MASS	1	0	0	0
DYSPNOEA	2	0	2	1
CHESTPAIN	0	0	1	0
PEDAL EDEMA	0	0	2	0
OTHERS	1	0	1	0

CHART NO.48 - SYMPTOMS IN HEMATOLOGICAL MALIGNANCIES

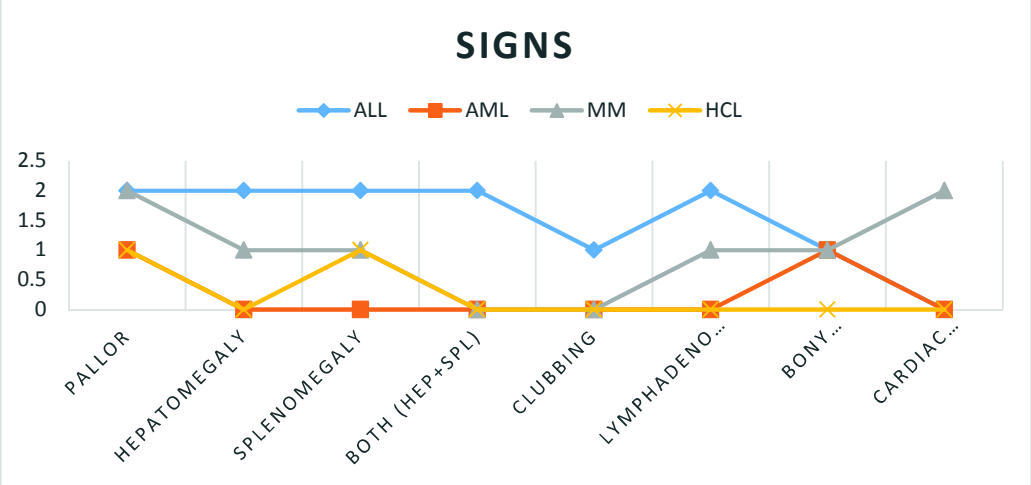
(TABLE 5.67)



SIGNS IN HEMATOLOGICAL MALIGNANCIES (TABLE - 5.68)

SIGNS	ALL	AML	MM	HCL
PALLOR	2	1	2	1
HEPATOMEGALY	2	0	1	0
SPLENOMEGALY	2	0	1	1
BOTH (HEP+SPL)	2	0	0	0
CLUBBING	1	0	0	0
LYMPHADENOPATHY	2	0	1	0
BONY TENDERNESS	1	1	1	0
CARDIAC FAILURE	0	0	2	0

CHART NO.49 - SIGNS IN HEMATOLOGICAL MALIGNANCIES



HEMATOLOGICAL PARAMETERS IN MALIGNANCY PRODUCING PANCYTOPENIA (TABLE- 5.69,5.70,5.71)

	MEAN		
MALIGNANCY	**HB% IN GMS**	**TOTAL COUNT**	**PLATELET COUNT**
ALL	6.150	2100.00	26500.00
AML	5.600	800.00	18000.00
MULTIPLE MYEOMA	6.950	2200.00	25500.00
HCL	4.200	2300.00	8000.00

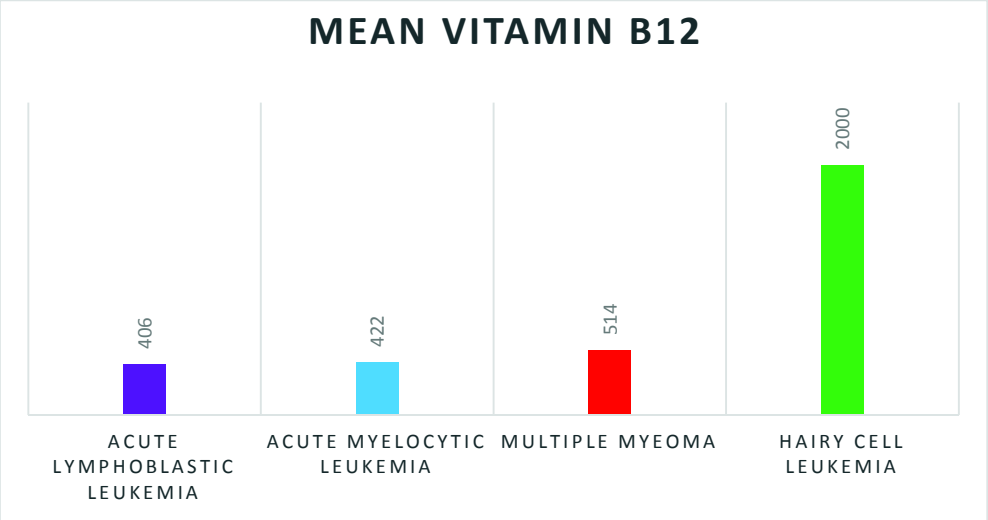
MALIGNANCY	MCV	ESR	RETIC.COUNT
ALL	83.000	71.00	1.25
AML	101.000	35.00	0.50
MULTIPLE MYEOMA	92.500	143.00	2.40
HCL	98.000	98.00	1.90

	MEAN		
MALIGNANCY	**LDH**	**UREA**	**CREATININE**
ACUTE LYMPHOBLASTIC LEUKEMIA	91.500	20.50	0.20
ACUTE MYELOCYTIC LEUKEMIA	441.000	33.00	1.20
MULTIPLE MYEOMA	601.000	48.50	1.85
HAIRY CELL LEUKEMIA	88.000	21.00	1.20

LFT IN VARIOUS HEMATOLOGICAL MALIGNANCIES CAUSING PANCYTOPENIA (TABLE - 5.72)

MALIGNANCY	T.BILIRUBIN	SGOT	SGPT
ACUTE LYMPHOBLASTIC LEUKEMIA	0.950	21.500	22.00
ACUTE MYELOCYTIC LEUKEMIA	0.800	26.000	22.00
MULTIPLE MYEOMA	1.350	39.500	23.50
HAIRY CELL LEUKEMIA	.500	28.000	22.00

CHART NO.50 – MEAN VITAMIN B12 IN VARIOUS HEMATOLOGICAL MALIGNANCIES CAUSING PANCYTOPENIA

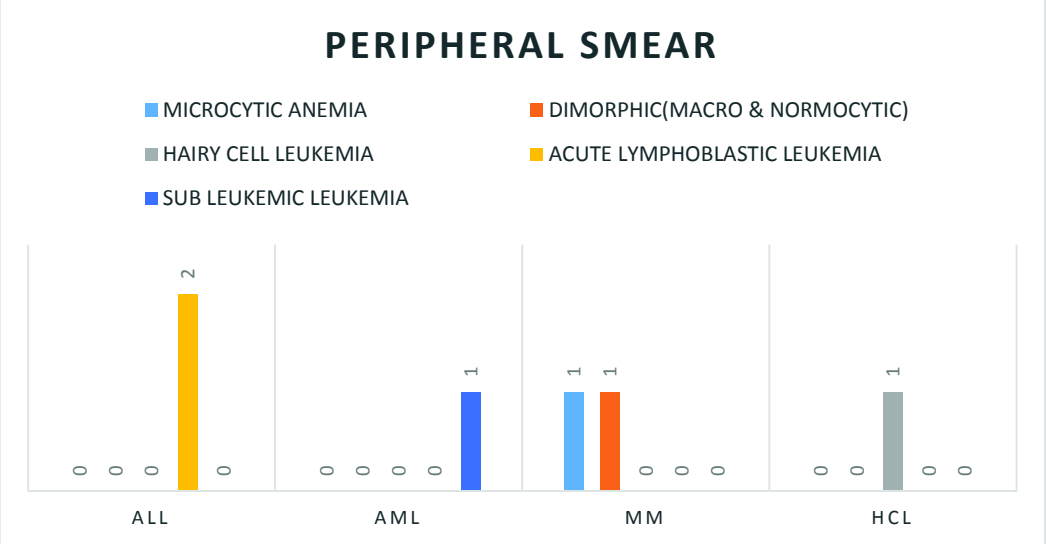


PERIPHERAL SMEAR IN HEMATOLOGICAL MALIGNANCY

(TABLE-5.73)

PERIPHERAL SMEAR	ALL	AML	MM	HCL
MICROCYTIC ANEMIA	0	0	1	0
DIMORPHIC(MACRO & NORMOCYTIC)	0	0	1	0
HAIRY CELL LEUKEMIA	0	0	0	1
ACUTE LYMPHOBLASTIC LEUKEMIA	2	0	0	0
SUB LEUKEMIC LEUKEMIA	0	1	0	0

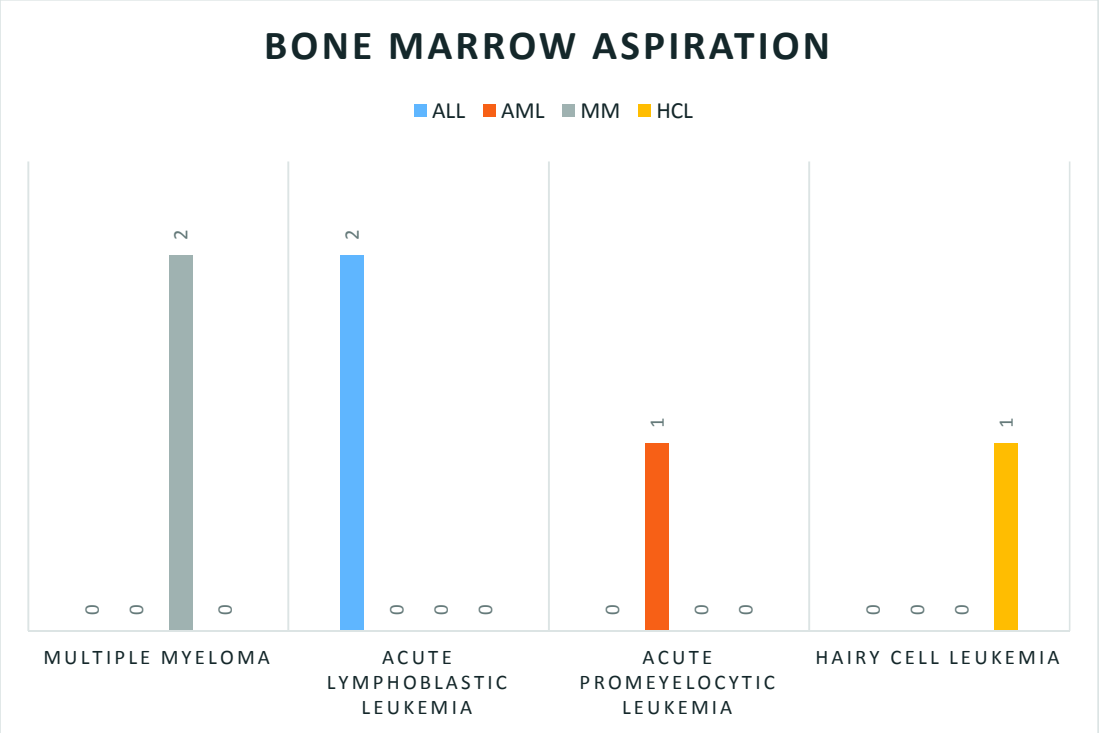
CHART NO.51 - PERIPHERAL SMEAR IN HEMATOLOGICAL MALIGNANCY



BMA IN HEMATOLOGICAL MALIGNANCIES (TABLE-5.74)

BONE MARROW ASPIRATION	ALL	AML	MM	HCL
MULTIPLE MYELOMA	0	0	2	0
ACUTE LYMPHOBLASTIC LEUKEMIA	2	0	0	0
ACUTE PROMEYELOCYTIC LEUKEMIA	0	1	0	0
HAIRY CELL LEUKEMIA	0	0	0	1

CHART NO.52 - BMA IN HEMATOLOGICAL MALIGNANCIES



OBSERVATIONS AND CORRELATIONS

In this present study of 100 cases of pancytopenia, we have noted the following observations.

1. Of the 100 cases, 29 patients were of age < 30 yrs, 21 patients were of age group 31 – 40 years, 31 patients were of age group 41-50 yrs, 4 patients were of age group 51-60, 33 pateints were of age group > 60 yrs. Hence, by this study, pancytopenia is more common in fifth and seventh decade but less common in 6^{th} decade.

2. Of the 100 cases, 61 cases were males, remaining 39 patients were females.

3. Majority of the patients in this study consumes mixed diet (83%) and majority of patients did not consume alcohol (61%) which represents the diverse causes of pancytopenia, in addition to alcoholism.

4. Majority of patients in this study (77%) did not have any significant co-morbid illness but only a few (18%) had hypertension as their comorbid condition.

5. Major symptoms encounterd in our patients were fatique(89%),bleeding manifestations(72%), dyspnoea on exertion(70%),anorexia(67%),pedal edema(36%), fever(35%), weight loss(34%). Minor symptoms were

abdominal pain (31%), abdominal distension(16%), chest pain(5%), abdominal mass(4%) and others(19%).

6. Of signs, PALLOR(99%) was the predominant sign followed by patients with cardiac failure(27%). In minority of patients, signs noted were hepatomegaly (21%), spleenomegaly(21%), jaundice(16%), ascites(15%), clubbing (9%), lymphadenopathy(8%), and bony tenderness(3%).

7. ECG of majority of patients(74%) were normal but few(25%) patients had left ventricular hypertrophy which may be as a result of associated hypertension or as a result of cardiac failure in severely anaemic patients and one patient had atrial fibrillation which was due to hyperthyroidism.

8. Chest x-ray of majority of patients(63%) were normal but some patients (27%) had cardiomegaly. Fibrocavity changes(3%) were seen in TB patients. Pneumocystic carinii pneumonia associated chest x-ray findings were noted in HIV patients.

9. Regarding bone marrow cellularity, 18% had hypocellular marrow and 72% had hypercellular marrow. In remaining 10% of patients, bone marrow aspirations were not done because it was not clinically needed and they had malaria, TB, HIV as their cause of pancytopenia. Regarding bone marrow trephine biopsy, it was done only in patients whose bone marrow aspiration

yielded ‘dry tap’ and subsequently these patients were found to have aplastic anemia as their cause of pancytopenia.

10. By this study, probable cause of pancytopenia or primary diagnosis of these 100 cases of pancytopenia were as follows:(in descending order of frequency)

    a. MEGALOBLASTIC ANEMIA(36%)

    b. APLASTIC ANEMIA(18%)

    c. INFECTIONS (12%)- HIV,TB,MALARIA

    d. MYELODYSPLASTIC SYNDROME(10%)

    e. CHRONIC LIVER DISEASE/HYPERSPLEENISM(10%)

    f. AUTO IMMUNE DISEASES (8%)- SLE,GRAVE’S DISEASE.

    g. HEMATOLOGICAL MALIGNANCIES (6%)- ALL, AML, MULTIPLE MYELOMA, HAIRY CELL LEUKEMIA.

CLINICO-HEMATOLOGICAL CORRELATION OF EACH CAUSES OF PANCYTOPENIA:

A. MEGALOBLASTIC ANEMIA;(n=36)

1. Of 36 patients of megaloblastic anemia, etiology found were divided into three groups-nutritional(50%), alcoholism(39%) and malabsorptional(11%).

2. Patients with megaloblastic anemia due to nutritional causes predominantly consumes veg. diet (n=16)which is statistically significant and also subsequently causing pancytopenia in these group of patients.

3. Mean age is 32.4 yrs and predominant sex involved is MALES

4. Predominant symptoms were fatique and bleeding manifestations in nutritional & alcoholism groups but diarrhea in malabsorptional group.

5. Predominant signs were pallor in all three groups but hepatomegaly (n=7) is also noted in alcoholism group.

6. Mean HB is 6.2 g (nutritional group),5.2 g (alcoholism), 7.3 g(malabsorptinal group). Mean TC is 2981cells(nutritional), 2395 (malabsorption), 3264 (alcoholism). Mean Platelet counts were 29772 cells(nutritional), 76500 (malabsortional), 37142 cells(alcoholism).

7. Mean MCV were high in all three groups(>109.6). ESR is elevated only in malabsorptional group. Mean LDH is elevated in both alcoholism and malabsorptional groups. RFT & LFT were normal.

8. Mean vitamin b12 levels were decreased in all three group(mean -108.13) but very much reduced in malabsortional groups.

9. Peripheral smears showed predominantly macrocytic anemia picture in nutritional and malabsorptional groups but dimorphic(microcytic & macrocytic) anemia picture in alcoholism group.

10. Bone marrow aspiration study showed megaloblastic maturation in all three groups but few patients(n=3) in alcoholism showed reactive hypercellular marrow.

B. APLASTIC ANEMIA(n=18):

1. Mean age group of these patients were 64.67(above 60 yrs). And M:F ratio is 8:10

2. Predominant symptoms were fatique(n=18),bleeding manifestation (n=16), anorexia, dyspnoea(n=15), pedal edema(n=12) and fever(n=6).

3. Predominant signs were pallor (n=17) and cardiac failure(n=12)

4. CBC showing mean HB – 3.4 g(very low), TC of 2092 cells and platelet count of 15772 cells which explains incidence of cardiac failure and bleeding manifestation were high in these group of patients.

5. Peripheral smear picture predominatly showing dimorphic (macrocytic & normocytic) anemia.

6. Bone marrow aspiration yielded a dry tap and bone marrow trephine biopsy subsequently confirming aplastic anemia.

C.INFECTIONS (n=12)

1. In this group, HIV(n=6) was the predominant cause of pancytopenia and TB, malaria (n=3) also caused pancytopenia in our study.

2. Mean age of these patient is 36.17 yrs

3. Predominant symptoms were fever, fatique, weight loss and bleeding in HIV & TB patients whereas fever, encephalopathy, bleeding, abdominal pain were predominant symptoms in malaria patients.

4. Predominant signs were pallor, lymphadenopathy(n=5) in HIV patients and pallor, hepatomegaly, jaundice in malaria patients.

5. Mean Hb was very low in TB group of patients(Hb=6.1g), TC is very low(2650) & platelet count is also low (29420) in HIV group of patients when compared to other groups.

6. MCV is high only in HIV group of patients(104.3) whereas ESR is elevated in all three groups(>70).

7. Renal failure and deranged LFT is observed only in malaria group of patients. Both HIV and TB patients had low vit.b12 levels whereas in malaria apteints it is normal

8. Peripheral smear showed dimorphic anemia in both HIV& TB patients whereas it is almost diagnostic in malaria patients where it showed microcytic anemia picture with gametocyte of P.falciparum.

9. Bone marrow aspiration is dine only in TB patients where it showed reactive hypercellular marrow.

D.MYELODYSPLASTIC SYNDROME(n=10):

1. Mean age group is 64.2 yrs and predominant sex affected is female.

2. predominant symptoms in this group of patients were fatique, anorexia, dyspnoea, pedal edema.

3. Predominant signs were pallor and congestive cardiac failure.

4. Mean Hb is 4.14g, TC is 3203 cells, platelet count is 49790 cells.

5. Mean MCV for this group of patients is high(110) and vitamin b12 levels were also low(174).

6. Peripheral smear showed only dimorphic anemia(macrocytic & microcytic) in all 10 patients and bone marrow aspiration study done subsequently showed MDS picture.

E.CHRONIC LIVER DISEASE(n=10)

1. Mean age group of these group of patients is 46.7 yrs and predominant sex affected are males.

2. All these patients consumed mixed diet and invariably all patients were alcoholic (n=9)except one female patient for whom NAFLD is the cause of cirrhosis of liver.

3. Predominant symptoms were abdominal distension(n=8),bleeding manifestations(n=9) like hemetemesis or melena, pedal edema, anorexia, fatigue and dyspnoea.

4. Pallor ,ascites and spleenomegaly were invariably seen in all 10 patients and jaundice was present in 8 patients.

5. Mean Hb is 6.6 g, TC is 3033 cells, and platelet count is 51852 cells. Mean MCV is high(105.7). Mean vit.B12 level is normal(317)

6. LFT showing mean bilirubin of 4.35, SGOT is 227.8, SGPT is 103. Albumin:globulin ratio is reversed in all 10 patients

7. Peripheral smear picture showed dimorphic (macrocytic & microcytic) anemia in all 10 patients. Bone marrow aspiration study predominantly showed reactive hypercellular marrow.

F.AUTOIMMUNE DISEASE: (N=8)

1. SLE (n=7) & Grave's disease(n=1) caused pancytopenia in this group of patients.

2. Mean age group is 29.8 yrs and sex affected predominantly were females

3. Predominat symptoms in SLE patients were fatigue, weight loss, fever and bleeding manifestations whereas one graves disease patient in our study presented with fatigue, pedal edema,weight loss, dyspnoea, & abdominal distension.

4. In SLE patients, pallor, alopecia, and hepatospleenomagaly were the predominant signs, whereas Graves disease patient presented with anaemia with cardiac failure, jaundice and atrial fibrillation.

5. Mean Hb is 7.7 g for SLE & 8.9 g for graves disease,TC is 3164 cells(SLE) & 2800 cells(graves disease), mean platelet count is 29885 cells(SLE patients) & 42000 cells(graves disease)

6. ESR is elevated for both of these patients. Hemolytic picture(elevated LDH, unconjugated hyperbilirubinaemia) is seen in graves disease patient.

7. Anti-TPO antibody is positive in graves disease patient and Anti-dsDNA is positive in all SLE patients in our study.

8. Peripheral smear in SLE patients showed both microcytic anemia and dimorphic anemia whereas in graves disease patient it showed dimorphic anemia(macrocytic& normocytic) picture only

9. Bone marrow aspiration study showed hypercellular marrow with microerythroblastic maturation in all SLE patients whereas graves disease patient showed cellular marrow with few megaloblastic maturation.

G. HEMATOLOGICAL MALIGNANCIES: (n=6)

1. Four hematological malignancy had caused pancytopenia in our study-ALL(N=2),AML(n=1),MULTIPLE MYELOMA(n=2), and HAIRY CELL LEUKEMIA(n=1).

2. Acute Lymphoblastic Leukemia patients presented with fever,weight loss,bleeding gums,pallor,hepatospleenomegaly and lymphadenopathy whereas AML patient presented with fever,fatigue, weight loss,anorexia, pallor and bony tenderness.

3. Both multiple myeloma patients presented with fatigue,loss of weight, pallor, hepatospleenomegaly, and cardiac failure wheras hairy cell leukemia patient presented with fatigue,bleeding,loss of weight,and spleenomegaly.

4. CBC showing low Hb(mean=5) in all malignancies. TC was very much low(800Ccells) in AML.platelet count also very low in these group of disorders(mean=15500).

5. ESR was raised in all of these patients but it is > 100 in Multiple myeloma patient in this study. LDH was raised in AML & multiple myeloma.

6. RFT was abnormal in both cases of multiple myeloma(creatinine=1.85).

7. Peripheral smear revealed subleukaemia leukemia in AML patient, and dimorphic anemia in multiple myeloma Whereas smear showed lymphoblast and hairy cell in both these leukemias. And bone marrow aspiration we did in these patients subsequently revealed the underlying malignancy.

DISCUSSION

Peripheral pancytopenia may be a manifestation of a wide variety of disorders which primarily or secondarily affect the bone marrow. The pattern of disease leading to pancytopenia is expected to vary in different population groups with their differences in nutritional status, and prevalence of infective disorders. In India the causes of pancytopenia are not well defined.

There are limited number of studies on the frequency of various causes of pancytopenia. Limited data has been reported from the Indian subcontinent. The variation in the frequency of various diagnostic entities causing pancytopenia has been attributed to differences in methodology and stringency of diagnostic criteria, geographic area, period of observation ,genetic differences and varying exposure to myelotoxic agents.

In this present study, the most common cause of pancytopenia is megaloblastic anemia(36%) followed by aplastic anemia(18%),infections(12%), myelodysplastic syndrome(10%),chronic liver disease(10%), autoimmune disorders(8%) and hematological malignancy(6%). Infections caysing pancytopenia are many like overwhelming sepsis,malaria, disseminated TB, Brucellosis, leishmaniasis, Q fever, HIV, etc but in this study, infection encountered were mainly HIV,TB and malaria.

Autoimmune disorders causing pancytopenia are many like SLE, sarcoidosis, thyroid disordersetc but in this study pancytopenia is seen only in SLE & Grave's disease.

A comparison of the most common causes of pancytopenia in different studies:

Study group	Country	Year	No. of cases	Commonest cause
IAASG	Israel & europe	1987	319	Hypoplastic anemia
Hossain et al	Bangladesh	1992	50	Hypoplastic anemia
Verma &Dash	India	1992	202	Hypoplastic anemia
Tilak & Jain	India	1999	77	Megaloblastic anemia
Kumar et al	India	1999	166	Hypoplastic anemia
Khodke et al	India	2000	50	Megaloblastic anemia
Bajracharya et al	Nepal	2005	23	Hypoplastic anemia
Present study	**India**	**2018**	**100**	**Megaloblastic anemia**

IAASG-International Agranulocytosis and Aplastic Anemia Group

The commonest cause of pancytopenia, reported from various studies throughout the world has been aplastic anaemia[5]. This is in sharp contrast with the results of various Indian studies where the commonest cause of pancytopenia is megaloblastic anaemia[7,28]. Results observed in present study were also similar to those Indian studies. This seems to reflect the higher prevalence of nutritional anemias in Indian subjects.

The incidence of megaloblastic anaemia varied from 0.8 to 32.26% of all pancytopenic patients[5]. Our incidence of megloblastic anaemia was 36 %. Incidence of 72% was reported by Khunger JM et al and 68% by Tilak V et al. All the above studies done in India, stress the importance of megaloblastic

anaemia being the major cause of pancytopenia. It is a rapidly correctable disorder and should be promptly notified[7]

Incidence of aplastic anaemia varies from 10-52 % among pancytopenic Patients[7]. Our incidence of aplastic anaemia was 18 %, which correlated with the studies done by Khodke K et al and Khunger JM et al whose incidence for the same was 14%[7, 28]. A higher incidence of 29.5% was reported by Kumar R et al[4]. Most of the cases of aplastic anaemia were idiopathic.

The incidence of aplastic anaemia quoted from the western studies is much higher than that observed in Indian studies. This increased incidence of aplastic anaemia in the western world may be related to environmental factor such as increased exposure to toxic chemicals[28]

Incidence of aplastic anaemia varies from 10-52 % among pancytopenic Patients[7]. Our incidence of aplastic anaemia was 18 %, which well correlated with the studies done by Khodke K et al and Khunger JM et al whose incidence for the same was 14%[7, 28]. A higher incidence of 29.5% was reported by Kumar R et al[4]. Most of the cases of aplastic anaemia were idiopathic

AIDS was diagnosed in 25% of the study cases in patients with multilineage blood cytopenia and is now the commonest clinical condition associated with it in a central referral hospital in Zimbabwe{30}. In our study 6% of the patients were found to be HIV seropositive,and the odds of

having tuberculosis and infiltrative disorders were significantly higher as compared to non-HIV infected individuals.Other causes of pancytopenia in HIV infection include drug induced aplasia,cryptococcosis [31] and toxoplasmosis [32]. Hence, with increasing incidence of HIV infection ,a careful search for tuberculosis and other infiltrative disorders is mandatory in immunocompromised individuals.

Bone marrow in our study was predominantly hypercellular[72%] in concordance with Imbert et al [2] where 66% of the subjects had hypercellular marrow.

Megaloblastic Anaemia was observed to be the commonest cause of Pancytopenia in this study. This fact indicates the wide prevalence of Vitamin B12 and folate deficiency in Tamil Nadu state and other states of India. If this nutritional deficiency, which is widely prevalent now in our country is set right, the number of Pancytopenia cases reported in the Hospitals will no doubt get drastically reduced.

Hence, in India, this study stress the importance of megaloblastic anaemia being the major cause of pancytopenia. It is a rapidly correctable disorder and should be promptly notified[7].

SUMMARY OF THE STUDY

- This is a prospective Clinico-Hematological obsevational study on Pancytopenia over a period of 12 months from July 2017 to June 2018 in the M6 Unit, Department of General Medicine, Coimbatore Medical College, Coimbatore.
- 100 patients in age group between18-65yrs presenting with pancytopenias were evaluated.
- A combined evaluation of history, physical findings, primary haematological/biochemical investigations and bone marrow aspiration /bone marrow trephine biopsy were done in pancytopenic patients.
- The age of the patients ranged from 18 years to 65 years with a mean age of 45 years.Males accounted for 61 cases (61%) and female 39 cases(39%) with a M:F ratio of 1.5:1.
- Commonest presenting complaint was fatigue , bleeding manifestations and dyspnoea. Commonest physical finding was pallor followed by cardiac failure and then hepatomegaly & splenomegaly.
- Megaloblastic anemia (36 %) was the commonest cause of pancytopenia followed by hypoplastic /aplastic anemia(18 %), infections (12 %), myelodysplastic syndrome(10%),chronic liver disease(10%), autoimmune disorders(8%) and hematological malignancy(6%).
- Lowest haemoglobin percentage was 1.6 gm/dl and it was noted in a case of aplastic anaemia.
- Lowest total leucocyte count was 500 cells/mm3 and noted in a case of acute promyelocytic leukemia.

- Lowest platelet count of 2000 cells/mm3 was noted in a case of aplastic anaemia.
- Serum vitamin B12 level is low in 59% of patients of which 36% of patients were found to have megaloblastic anemia.
- Abnormal RFT/Renal failure is noted in only 7% of patients which were mainly seen in multiple myeloma & malaria patients.
- Abnormal LFT is observed only in 25% of patients of which chronic liver disease, hematological malignancy & infection were the major cause of pancytopenia.
- ECG is abnormal in 26% of patients and left ventricular hypertrophy is the abnormal finding in 25% of patients which is due to associated comorbid condition i.e., hypertension.
- Chest X-RAY is abnormal only in37% of patients of which cardiomegaly is the most common abnormality noted.
- Predominant USG abdomen findings is normal study(63%) followed by hepatospleenomegaly(22%).
- Dimorphic anaemia(microcytic&macrocytic) was predominant blood picture in pancytopenic patients
- Hypercellular marrow was noted in 72 patients and the commonest cause was megaloblastic anaemia, followed by leukemia,infections, MDS and chronic liver disease. Hypocellular marrow was noted in 18 patients and the commonest cause was aplastic anaemia.

CONCLUSION

Pancytopenia is not an uncommon haematological problem encountered in clinical practice and should be suspected on clinical grounds when a patient presents with unexplained anaemia, prolonged fever and tendency to bleed.

- The history, physical findings and CBC/hematological/biochemical parameters provides valuable information in the work of pancytopenic patients.
- Evaluation of peripheral blood film reveals the most probable cause of anaemia, presence of nucleated RBC's and/or immature myeloid cells may suggest marrow infiltration or primary haematologic disorder.
- Bone marrow aspiration is an important diagnostic tool in haematology which helps to evaluate various cases of pancytopenia
- Megaloblastic anaemia was the commonest cause which indicates the high prevalence of nutritional anaemia in our region.
- However, rare causes such as multiple myeloma,hairy cell leukemia, storage disease,sarcoidosis,overwhelming sepsis should be always kept in mind while planning investigation for complete work up of pancytopenic patients.

- Tuberculosis and HIV being highly prevalent and endemic in India, it is essential to be aware of its manifestation as pancytopenia.

- Present study concludes that detailed history,clinical features, primary haematological investigations along with bone marrow examination in pancytopenic patients is helpful for understanding the disease process, to diagnose or to rule out the causes of pancytopenia and helpful in planning further investigations and management of pancytopenic patients.

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ANNEXURE- I

CASE PROFORMA

Serial Number: **Hospital Number**:

Name

AGE/SEX

Occupation

Address

Presenting complaints:

	Present/Absent	**Duration**
1. *Easy fatigability*		
2. *Breathlessness*		
3. *Palpitation*		
4. *Chest pain*		
5. *Swelling of limbs*		
6. *Fever*		
7. *Sore throat*		

8. *Bone pains*
9. *Bleeding tendencies*
10. *Others*

Past History:

Drug intake

Blood transfusions

Jaundice

Radiation exposure

Similar complaints

Admission to hospital

Family History:

Similar complaints

Bleeding tendencies

Personal History:

Diet *Appetite* *Habits* *Bowel/Bladder*

Consanguinity

Menstrual cycle

Obstetric History [Miscarriage/IUGR]

GENERAL EXAMINATION:

Built *Nourishment* *Pallor* *Icterus* *Edema*

Lymphadenopathy

Bone tenderness *Gum hypertrophy* *Glossitis* *Koilonychia*

Bleeding manifestations *Hyper-pigmented knuckles*

Vitals:BP, PR, SPO2

SYSTEMIC:

Abdomen: Organomegaly/Free fluid

CVS

RS

CNS: Reflexes

Plantar

Sensory system

INVESTIGATIONS:

Essential investigations in all cases-

Hemoglobin *Total count* *MCV*

Platelets

PERIPHERAL SMEAR

Reticulocyte COUNT

BONE MARROW ASPIRATION STUDY

Bone marrow TREPHINE BIOPSY

Others:

UREA *Creatinine*

LDH *LFT*

B12 Anti-TPO Ab

HIV *ANA/Anti-ds DNA*

ECG S.*Protein electrophoresis*

Chest x ray *U/S Abdomen*

ANNEXURE-II

CONSENT FORM (ENGLISH)

I have come to know that Dr. M.MOHAMED FAIZAL BASHEER, Postgraduate in the Department of General Medicine is conducting a study on the topic, "A STUDY OF 100 CASES OF PANCYTOPENIA: A CLINICO-HEMATOLOGICAL CORRELATION".

I understand that I will not have to suffer any harmful consequences as a result of the study nor will I have any financial constraints. It is understood that blood will be collected from me/bone marrow aspiration or trephine biopsy will be done for me for the purpose of conducting this study. I also understand that I can withdraw myself from this study at any point of time and by doing so it will not affect my treatment in any manner. Understanding all these, I wholeheartedly agree to take part in this study.

Signature

Name of the patient:

Signature

Name of the doctor:

Place:

Date:

ஒப்புதல் படிவம்

பெயர் :

வயது :

பாலினம் :

முகவரி :

கோவை அரசு மருத்துவக் கல்லூரி மருத்துவமனையில் மரு.மு.முகமது ஃபைசல் பசீர் தலைமையில் நடைபெறும் இந்த ஆய்வில் எனது முழுஉடல் மற்றும் **இரத்த பரிசோதனை மற்றும் எலும்பு மச்சை பரிசோதனை** செய்து கொள்ள முழு மனதுடன் சம்மதிக்கிறேன். என்னைப் பற்றிய விவரங்களை பாதுகாப்புடன் இந்த ஆய்வில் வெளியிட ஆட்சேபணை இல்லை என்று தெரிவித்துக் கொள்கிறேன். நான் எந்த நேரத்திலும் ஆய்வில் இருந்து விலக்கிக் கொள்ளும் உரிமை உண்டு என்று அறிவேன்.

இடம் கையொப்பம்/கைரேகை

தேதி

ANNEXURE-III

KEY TO MASTER CHART

ECG

0-NORMAL STUDY

1-LVH WITH STRAIN

2-ATRIAL FIBRILLATION

CHEST X RAY PA VIEW

0- NORMAL STUDY

1- CARDIOMEGALY

2- MEDIASTINAL WIDENING/LYMPHADENOPATHY

3- FIBROCAVITY RIGHT UPPER ZONE OF LUNG

4- MILIARY TUBERCLES IN BOTH LUNG FIELDS(MILIARY TB)

5- SUGGESTIVE OF INSTERSTITIAL PNEUMONIA (PCP PNEUMONIA)

USG ABDOMEN PELVIS

0- NORMAL STUDY

1- HEPATOMEGALY

2- HEPATOMEGALY WITH FATTY LIVER

3- SPLEENOMEGALY

4- HEPATOSPEENOMEGALY

5- LIVER –INCREASE IN ECHOTEXTURE WITH MILD SPLEENOMEGALY/ASCITES- S/O CHRONIC PARENCHYMAL LIVER DISEASE/PORTAL HYPERTENSION
6- HEPATOMEGALY WITH PARAAORTIC LYMPHADENOPATHY
7- OTHERS(MEDICAL RENAL DISEASE)

PHERIPHERAL SMEAR

0 - NORMOCYTIC NORMOCHROMIC ANAEMIA (**normal**)

1-MICROCYTIC & HYPOCHROMIC ANAEMIA, LEUCOPENIA, THROMBOCYTOPENIA (**MICROCYTIC ANAEMIA)**

2-DIMORPHIC ANAEMIA (microcytic and macrocytic anaemia with tear drop cells, leucopenia, thrombocytopenia) (**DIMORPHIC ANAEMIA-BOTH MICROCYTIC AND MACROCYTIC**)

3-**DIMORPHIC ANAEMIA (predominantly macrocytic anaemia)**, leucopenia, thrombocytopenia

4-MICROCYTIC AND NORMOCYTIC ANAEMIA, LEUCOPENIA, THROMBOCYTOPENIA (**DIMORPHIC ANAEMIA -BOTH-MICROCYTIC & NORMOCYTIC ANAEMIA)**

5-**HAIRY CELL LEUKAEMIA(**RBCS-MICROCYTIC &NORMOCYTIC, wbcs-lymphoid cells showing pale blue cytoplasm having fine hair like projections with ruffled cytoplasmic borders, nuclei-round to oval with homogenous chromatinwith prominent nucleoli, platelets –reduced in count**)**

6- **ACUTE LYMPHOBLASTIC LEUKAEMIA**(lymphoblast 40%-large sized cell having high N:C ratio, scantycytoplasm, irregular nuclei showing 1-2 prominent nucleoli with nuclear clefting)

7- MICROCYTIC& MACROCYTIC ANAEMIA,LEUCOPENIA **WITHSUB LEUKAEMIC LEUKAEMIA**(FEW BLAST < 10%), THROMBOCYTOPENIA

8- MICROCYTIC&NORMAOCHROMIC ANAEMIA, LEUCOPENIA, THROMBOCYTOPENIA, GEMETOCYTE OF PLASMODIUM FALCIPARUM SEEN **(MALARIA)**

BONE MARROW ASPIRATION CYTOLOGY

0- NO MARROW ABNORMALITY

1-ERYTHROID HYPERPLASIA WITH PREDOMINANT MEGALOBLASTIC MATURATION. MYELOIDS ERIES-NORMAL, MEGAKARYOCYTES-ADEQUATE **(MEGALOBLASTIC ANAEMIA)**

2-erythroid hyperplasia with micronormoblastic and FEW megaloblastic maturation. myeloid series-normal, megakaryocytes-normal**(REACTIVE HYPERCELLULAR MARROW WITH FEW MEGALOBLASTIC MATURATION)**

3 -reactive erythroid hyperplasia with dyserythropoeisis with MINIMAL megaloblastic maturation **(MDS)**

4 - dry tap- dilute pauci cellular smear**(APLASTIC ANAEMIA)**

5 - marrow showing normoblastic/micronormoblasticmaturation,myeloid series-normal, few megakaryocytes seen(**NORMAL MARROW WITH MICROERYTHROBLASTIC MATURATION)**

6-plasma cell myeloma(plasma cell-50%-other hematopoietic elements suppressed)-**MULTIPLE MYELOMA**

7-ACUTE LYMPHOBLASTIC LEUKAEMIA(SMEARS ARE cellular with predominant cells being lymphoblast-90%,other bone marrow elements suppressed)

8-ACUTE PROMYELOCYTIC LEUKAEMIA(MYELOID SERIES- BLAST & PROMYELOCYTE CONSTITUTIING >70%- blast- medium sized cell with scanty cytoplasm having large irregular nuclei with fine chromatin, promyelocyte-large sized cell having moderate cytoplasm with prominent granules & large irregular nuclei, other hematopoietic elements suppressed)

9- HAIRY CELL LEUKAEMIA

BONE MARROW TREPHINE BIOPSY

1- APLASTIC MARROW DISPLAYING FEW ISLANDS OF ERYTHROID PRECURSORS, fibroticareas, MILD LYMPHOCYTOSIS-APLASTIC ANAEMIA**(APLASTIC ANAEMIA**)
2- OTHERS

ALL SYMPTOMS AND SIGNS(FEVER,ABDOMINAL PAIN, ABDOMINAL DISTENSION, FATIQUE, BLEEDING, ANOREXIA, LOSS OF WEIGHT,LOSS OF APPETITE,ABDOMINAL MASS, DYSPNOEA, CHEST PAIN, OLIGURIA/LEGSWELLING, OTHERS, PALLOR, HEPATOMEGALY, SPLEENOMEGALY, BOTH, JAUNDICE, CLUBBING, LYMPHADENOPATHY, BONE TENDERNESS, CCF, ASCITES, OTHERS)

0 = ABSENT

1 = PRESENT

S.NO.	NAME	AGE	SEX	DIET	ALCOHOLISM	COMORBIDITIES	FEVER	ABD.PAIN	ABD. DISTENSION	FATIGUE	BLEEDING MANIFESTATIONS	ANOREXIA	WEIGHT LOSS	ABD. MASS	DYSPNOEA	CHEST PAIN/PALPITATION	OEDEMA/LEG SWELLING	OTHERS	PALLOR	HEPATOMEGALY ONLY	SPLEENOMEGALY ONLY	BOTH	JAUNDICE	CLUBBING	LYMPHADENOPATHY	BONY TENDERNESS	CARDIAC FAILURE	ASCITES	OTHERS	HB IN G	TC(CELLS/CU.MM)	PLATELET COUNT	MCV IN FI	ESR MM/HR	RETICULOCYTE COUNT(%)	LDH	UREA(MG/DL)	CREATININE(MG/DL)	BILIRUBIN-TOTAL/DIRECT	SGOT/SGPT	TOTAL PROTEIN/ALBUMING LOBULIN	ALP	HIV	SERUM B12 LEVEL	ECG	CXR	USG	PS	OTHER INVESTIGATION	BM CELLULARITY	BMA	BMTB	FINAL DIAGNOSIS/PROBABLE CAUSE/COMORBID CONDITION
1	PAPPATHY	64	F	MIXED	NO	NO	1	0	0	1	0	0	0	0	1	0	1	0	1	1	0	0	0	0	0	0	0	0	3.5	1100	21000	100	56	1.2	102	20	0.3	1.4/0.5	55/38	6.1/3.5/2.6	68	negative	182-LOW	0	0	1	3		hypercellular	1		MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
2	PALANIYAMMAL	65	F	VEG	NO	HYPERTENSION	0	0	1	1	MELENA	1	0	0	0	0	1		1	1	1	1	0	1	0	0	0	1	7.4	3400	82000	85	46	0.5	104	24	0.9	2/0.7	16/86	5.3/2.3/3	86	negative	258-NORMAL	0	1	2	2		hypercellular	2		CHRONIC LIVER DISEASE-FATTY LIVER(NAFLD)
3	GOPAL	45	M	MIXED	YES	NO	0	1	0	1	0	0	0	0	0	0	0		1	1	0	0	0	0	0	0	0		4	2200	54000	112	60	2.2	1080	20	0.8	1.8/0.7	58/60	6.1/3.6/2.5	72	negative	102-very low	0	0	2	3		hypercellular	1		CHRONIC ALCOHOLISM/MEGALOBLASTIC ANAEMIA/HEMOLYTIC ANAEMIA
4	ARUMUGAM	46	M	MIXED	YES	NO	1	1	0	1	1-melena,gum bleed	1	1	0	0	0	0		1	1	1	1	0	0	0	0	0	1	6.2	1300	4000	94	92	2.3	1192	28	1.1	2.2/1.2	36/20	5.4/2.4/3	127	NEGATIVE	221-NORMAL	0	0	5	2	OGD SCOPY-ESOPHAGEAL VARICES	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
5	SALMA	64	F	MIXED	NO	NO	0	0	0	1	MELENA	0	0	0	1	0	0		1	0	0	0	0	0	0	0	0		4	2100	7000	89	15	1.9	88	21	1.2	0.5/0.2	22/20	6.5/3.7/2.8	89	negative	>2000-INCREASED	0	0	0	4		hypocellular	4	1	APLASTIC ANAEMIA
6	KAMATHAL	65	F	MIXED	NO	NO	0	0	1	1	0	1	1	0	1	0	1		1	1	0	0	0	0	1	0	1	0	5.3	2800	39000	108	160	2.2	138	25	1.5	0.6/0.2	25/22	10.3/2.8/7.5	41	negative	206-NORMAL	0	0	6	4	S.PROTEIN ELECTROPHORESIS-M BAND SEEN	hypercellular	6		MULTIPLE MYELOMA/RENAL FAILURE/ANAEMIA WITH CARDIAC FAILURE
7	RAJU	65	M	MIXED	YES	NO	0	1	0	1	HEMATEMESIS	1	1	0	0	0	0		1	0	0	0	0	0	0	0	0		6.6	2700	21000	83.7	68	1.2	122	26	1	0.6/0.2	40/32	7.5/3.9/3.6	355	negative	210-NORMAL	0	0	0	4		hypocellular	4	1	APLASTIC ANAEMIA
8	VELUMANI	19	F	VEG	NO	NO	0	0	0	1	0	0	0	0	1	0	0		1	0	0	0	0	0	0	0	0		8.2	1400	39000	82.8	14	0.8	382	18	0.4	0.6/0.4	22/20	6.8/4/2.8	38	negative	78-VERY LOW	0	0	0	3		hypercellular	1		MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
9	MANIKANDAN	24	M	MIXED	YES	NO	0	0	0	1	0	1	1	0	0	0	0		1	1	1	1	0	0	0	0	0		5.9	3100	6100	116	28	0.8	360	35	1.1	0.8/0.4	13/23	6.8/4.1/2.7	109	negative	92-LOW	0	0	4	3		hypercellular	1		MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
10	BARATH	25	M	MIXED	YES	NO	1	1	0	1	0	1	1	0	0	0	0	CHRONIC DIARRHOEA	1	0	0	0	0	0	0	0	0	0	7.7	2100	93000	104	38	3.2	6642	19	0.3	1.1/0.4	56/66	6.5/3.8/2.7	112	negative	52-VERY LOW	0	0	0	3		hypercellular	1		megaloblastic anaemia(malabsorption syndrome)/HEMOLYTIC ANAEMIA
11	RATNASAMY	65	M	MIXED	NO	DM	1	1	1	1	1-MELENA	1	0	0	1	1	1		1	0	0	0	0	0	0	0	1	1	3.6	3000	44000	115	72	0.2	812	61	1.8	2.6/0.5	16/21	6.6/3.6/3	95	negative	452-NORMAL	1	1	7	2		hypercellular	3		MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE
12	SALEEMA	64	F	MIXED	NO	NO	0	0	0	1	1	1	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	4.2	2300	8000	98	98	1.9	88	21	1.2	0.5/0.2	28/22	6.5/3.7/2.8	89	negative	>2000-INCREASED	0	0	3	5		hypercellular	9	-	HAIRY CELL LEUKAEMIA
13	SHARBUDEEN	20	M	MIXED	YES	NO	1	1	1	1	1	1	1	0	1	0	0	0	1	1	1	1	0	0	1	0	0	0	8.3	3400	47000	83	70	1.2	80	20	0.1	0.7/0.2	21/18	6/4.1/1.9	88	negative	400-NORMAL	0	2	4	6		hypercellular	7	-	SUB LEUKAEMIC LEUKAEMIA/ACUTE LYMPHOBLASTIC LEUKAEMIA
14	KALA	46	F	VEG	NO	NO	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	5.8	3200	84000	115	30	0.8	102	32	0.9	0.6/0.2	22/24	6.1/3.5/2.6	66	negative	106-DECREASED	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)/CARDIAC FAILURE
15	DHANABALAN	28	M	MIXED	NO	NO	1	0	0	0	1-MELENA	1	1	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	5.6	500	18000	101	35	0.5	441	33	1.2	0.8/0.4	26/22	6.4/4/2.4	78	negative	422-NORMAL	0	0	0	7	0	hypercellular	8		ACUTE PROMYELOCYTIC LEUKAEMIA
16	SHANMUGAM	65	M	MIXED	NO	NO	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	6.6	800	2000	83	40	0.8	174	72	2.5	3.8/1.1	22/21	6.2/4.2.2	95	negative	446-NORMAL	0	0	7	4	0	hypocellular	4	1	APLASTIC ANAEMIA/RENAL FAILURE/HEMOLYTIC ANAEMIA
17	PARASURAM	42	M	MIXED	YES	NO	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	0	0	0	1	1	7.2	3500	85000	112	42	1.2	163	32	0.8	6.6/2.4	148/68	5.8/2.2/3.6	142	negative	522	0	0	5	2	0	hypercellular	-	-	CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER
18	PARAMASIVAM	55	M	MIXED	NO	NO	0	0	1	1	0	1	1	0	1	1	1	DIARRHOEA	1	0	0	0	1	1	0	0	1	1	8.9	2800	42000	88	48	1.4	474	18	0.7	4.9/1.2	25/28	6.3/4/3.3	83	negative	488	2	1	0	4	TFT- SEVERE HYPERTHYROIDISM, ANTI-TPO AB - POSITIVE	hypercellular	2	-	HYPERTYHROIDISM/GRAVES DISEASE/HEMOLYTIC ANAEMIA/CARDIAC FAILURE
19	SARASWATHY	52	F	VEG	NO	NO	0	0	1	1	0	1	1	0	1	1	1		1	0	0	0	0	0	0	0	1	0	5.6	3800	85000	112	36	0.8	112	40	0.9	0.9/0.4	28/30	6.1/4/2.1	78	negative	66	1	1	0	3		hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)/CARDIAC FAILURE
20	SHOBANA	26	F	VEG	NO	NO	0	0	0	1	1-MENORRHAGIA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	6.8	2900	44000	122	22	1.1	122	20	0.4	0.6/0.3	30/22	6/3.9/2.1	40	negative	78	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
21	ERATH	28	M	MIXED	NO	NO	1	1	0	0	1- MELENA	0	0	0	0	0	0	ENCEPHALPATHY	1	1	0	0	1	0	0	0	0	0	8.3	3200	42000	83	88	0.8	102	60	1.8	3.6/2.2	222/182	6.3/4/3.3	102	negative	432	0	0	4	8	MP CARD TEST-P.FALCIPARUM+	-	-	-	SEVERE FALCIPARUM MALARIA
22	MANOJ	36	M	MIXED	YES	NO	1	0	0	1	0	1	1	0	0	0	0	DIARRHOEA	1	0	0	0	0	0	1	0	0	0	6.6	1200	24000	102	98	0.9	144	35	0.9	0.9/0.2	56/40	5/4.1/1.9	100	**POSITIVE**	192	0	0	0	2	CD4 COUNT - 306	-	-	-	HIV DISEASE
23	PARAMESHWARI	65	F	MIXED	NO	NO	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	5.2	3500	66000	90	32	0.6	98	40	0.9	1/0.5	36/34	6/3.4/2.6	90	NEG	202	0	0	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA
24	PRAKASH	19	M	VEG	NO	NO	0	0	0	1	1-MELENA,GUM BLEED	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6.1	2900	22000	109	18	2.2	1085	20	0.3	2/0.4	32/22	7.4/4/3.4	48	NEG	73	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
25	SAROJA	24	F	VEG	NO	NO	0	0	0	1	1-GUM BLEED	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	4.8	2200	18000	109	22	0.4	92	26	0.8	0.9/0.5	22/20	7/3.9/3.1	66	NEG	102	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)

S.NO.	NAME	AGE	SEX	DIET	ALCOHOLISM	COMORBIDITIES	FEVER	ABD.PAIN	ABD. DISTENSION	FATIGUE	BLEEDING MANIFESTATIONS	ANOREXIA	WEIGHT LOSS	ABD. MASS	DYSPNOEA	CHEST PAIN/PALPITATION	OLECRANAL EG SWELLING	OTHERS	PALLOR	HEPATOMEGALY ONLY	SPLEENOMEGALY ONLY	BOTH	JAUNDICE	CLUBBING	LYMPHADENOPATHY	BONY TENDERNESS	CARDIAC FAILURE	ASCITES	OTHERS	HB IN G	TC(CELLS/CU.MM)	PLATELET COUNT	MCV IN FI	ESR MM/HR	RETICULOCYTE COUNT(%)	LDH	UREA(MG/DL)	CREATININE(MG/DL)	B1LIRUBIN-TOTAL/DIRECT	SGOT/SGPT	TOTAL PROTEIN/ALBUMING LOBULIN	ALP	HIV	SERUM B12 LEVEL	ECG	CXR	USG	PS	OTHER INVESTIGATION	BM CELLULARITY	BMA	BMTB	FINAL DIAGNOSIS/PROBABLE CAUSE/COMORBID CONDITION
26	PRABHU	35	M	MIXED	YES	NO	0	0	0	1	1-MELENA	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	5.1	2800	13000	112	12	0.6	103	28	0.7	1.4/0.7	65/55	6.3/3.2/3.1	132	NEG	78	0	0	0	3	0	hypercellular	1		MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
27	SHANTHA	65	F	MIXED	NO	HT	0	0	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	3.6	2100	11000	86	22	0.2	52	36	1	0.8/0.5	20/22	5.9/3/2.9	72	NEG	368	1	1	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
28	ASHMITHA	19	F	MIXED	NO	no	1	0	0	1	1-MELENA	1	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	7.1	2980	38000	96	75	1.8	632	40	0.5	1.2/0.5	40/46	6.4/3.3/3.1	98	NEG	422	0	0	4	4	**ANA- POSITIVE, ANTI-dsDNA-POSITIVE**	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
29	MUTHU	32	M	VEG	NO	NO	0	0	0	1	1-MELENA	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6.2	3000	21000	110	20	1	620	22	0.6	1/0.3	34/20	7.4/4/3.4	50	NEG	126	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
30	SARASU	64	F	MIXED	NO	HT	0	0	0	1	1-EPISTAXIS	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	1.6	2000	9000	88	24	0.3	78	38	0.9	1/0.6	24/26	5.9/3/2.9	63	NEG	250	1	1	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
31	SHANMUGA SUNDARA	19	M	MIXED	NO	NO	1	1	1	1	1-GUM BLEED,MELENA	1	1	1	1	0	0	NIGHT SWEATS+	1	1	1	1	0	1	1	1	0	0	4	800	6000	83	72	1.3	103	21	0.3	1.2/0.6	22/26	5.9/3.9/2	78	negative	412-NORMAL	0	2	4	6		hypercellular	7	-	SUB LEUKAEMIC LEUKAEMIA/ACUTE LYMPHOBLASTIC LEUKAEMIA
32	ANJALI	36	F	MIXED	NO	NO	1	0	0	1	0	1	1	0	1	0	0	DRY COUGH	1	0	0	0	0	1	0	0	0	0	6.8	3900	67000	98	106	0.7	130	32	0.9	1/0.5	50/22	6.4/4/2.4	55	POSITIVE	120	0	5	0	2	CD4 COUNT - 106	-	-	-	HIV DISEASE/PNEUMOCYSTIS JEROVECII PNEUMONIA
33	ARUN KUMAR	55	M	MIXED	NO	NO	1	0	1	1	1-HEMOPTYSIS	1	1	0	1	1	0	COUGH,NIGHT SWEATS+	1	0	0	0	0	0	1	0	0	0	6.6	3860	29000	96	96	0.9	136	42	0.8	0.9/0.6	23/20	6.2/3.8/2.4	63	POSITIVE	220	0	3	0	2	CD4 COUNT-226	-	-	-	HIV TB CO INFECTION
34	GIRI	26	M	VEG	NO	NO	0	0	0	1	1-GUM BLEED	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	7	3600	19600	110	22	1.4	250	26	0.9	1.1/0.6	48/46	7/4.1/2.9	56	NEG	110	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
35	NILOFER	65	F	MIXED	NO	NO	1	0	0	1	1-GUM BLEED	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	2.2	1100	7000	82	16	0.2	84	38	0.8	0.9/0.7	44/42	6.2/3.9/2.3	70	negative	422	1	1	0	1		HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
36	PAARI	36	M	MIXED	YES	NO	0	1	0	0	1-HEMETEMESIS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	6.7	3790	23500	112	22	1	98	42	0.6	1.1/0.5	50/45	6.8/4/2.8	100	NEG	132	0	0	0	3		HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
37	SIVA	29	M	MIXED	YES	NO	0	1	0	1	1-MELENA	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	3.6	2300	9000	108	42	2.8	966	39	0.9	3.2/1	65/70	6.1/3.1/3	112	NEG	98	0	0	1	3		HYPERCELLULAR	2	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/HEMOLYTIC ANAEMIA
38	YEKHAIVAN	32	M	MIXED	YES	NO	0	1	0	1	1-MELENA	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	5.9	3900	19600	106	12	0.9	106	36	0.7	1/0.4	52/53	6.3/3.3/3	98	NEG	160	0	0	0	3		HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
39	KANNAPPAN	43	M	MIXED	YES	NO	0	1	1	0	1-HEMETEMESIS	1	1	0	1	0	1	0	1	0	1	0	1	0	0	0	1	0	6.9	2980	66000	110	32	1	108	32	0.8	4.6/2.3	248/100	5/2.2/2.8	198	negative	500	0	0	5	2	0	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
40	MANORAMA	65	F	MIXED	NO	HT	1	0	0	1	1- GUM BLEED	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	2.9	3100	22000	78	14	0.5	122	40	1	0.8/0.5	34/30	5.6/3.6/2	78	NEG	257	1	1	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
41	SUHASHINI	26	F	MIXED	NO	no	1	0	0	1	1-MENORRHAGIA	1	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	5.9	2560	28000	86	62	1	250	38	0.8	0.9/0.5	130/60	6.4/3.3/3.1	68	NEG	283	0	0	4	4	**ANA- POSITIVE, ANTI-dsDNA-POSITIVE**	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
42	MADHAN	42	M	MIXED	YES	NO	1	0	0	1	1-HEMPOTYSIS	1	1	0	1	0	0	DRY COUGH	1	0	0	0	0	1	0	0	0	0	5.8	2300	62000	72	94	0.6	140	32	0.9	1/0.6	32/22	5.9/3.9/3	70	NEG	183	0	4	0	1		hypercellular	2	-	DISSEMINATED TB
43	JOSHWA	39	M	MIXED	YES	NO	0	1	1	0	1-HEMETEMESIS	1	1	0	0	0	1	0	1	0	1	0	1	0	0	0	1	0	6.2	3600	58000	116	48	0.9	93	46	0.9	3.8/2.1	222/98	5.4/2/2.4	221	negative	418	0	0	5	2	0	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
44	PADMAVATHI	24	F	MIXED	NO	no	1	0	0	1	1-GUM BLEED	0	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	ALOPECIA+ /ORAL ULCERS+	7	3000	39000	78	76	1.1	400	42	0.6	1.1/0.6	100/55	6.5/3.5/3	36	NEG	360	0	0	4	4	**ANA- POSITIVE, ANTI-dsDNA-POSITIVE**	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
45	JOHNSON	65	M	MIXED	NO	HT	0	0	0	1	1-HEMETEMESIS	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	2.8	2100	9000	72	18	0.4	83	39	1	0.6/0.2	48/40	5.9/3.9/2	75	NEG	285	1	1	0	1	0	HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
46	SIVAJI	32	M	NON VEG	NO	NO	1	1	0	0	0	0	0	0	1	0	0	NIGHT SWEATS+	1	1	1	1	1	0	0	0	0	0	7.9	3100	44000	82	46	0.9	101	63	1.9	3.9/2	228/248	6.3/4/3.3	150	negative	259	0	0	4	8	MP CARD TEST-P.FALCIPARUM+	-	-	-	SEVERE FALCIPARUM MALARIA
47	KITTUSAMY	62	M	MIXED	YES	HT	0	0	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	3.6	2900	20000	116	50	1	95	40	1.1	1/0.4	40/28	6.1/3.9/2.2	103	NEG	98	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE
48	NARAYANAN	65	M	MIXED	YES	NO	0	0	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	3.2	1700	17000	85	22	0.3	85	42	1	0.7/0.6	42/25	6.2/3.9/2.3	72	negative	352	1	1	0	4		HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
49	ALAGESAN	64	M	MIXED	YES	HT	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	5.9	3400	65000	110	48	0.6	140	42	0.9	1.1/0.6	46/48	6.2/3.2/3	88	NEG	165	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME
50	SELVAKUMAR	64	M	MIXED	YES	HT	0	0	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	3	2600	29000	104	42	0.9	130	38	1	0.9/0.6	44/46	6/3.5/2.5	70	NEG	200	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE

S.NO.	NAME	AGE	SEX	DIET	ALCOHOLISM	COMORBIDITIES	FEVER	ABD.PAIN	ABD. DISTENSION	FATIGUE	BLEEDING MANIFESTATIONS	ANOREXIA	WEIGHT LOSS	ABD. MASS	DYSPNOEA	CHEST PAIN/PALPITATION	OLECRANEG SWELLING	OTHERS	PALLOR	HEPATOMEGALY ONLY	SPLEENOMEGALY ONLY	BOTH	JAUNDICE	CLUBBING	LYMPHADENOPATHY	BONY TENDERNESS	CARDIAC FAILURE	ASCITES	OTHERS	HB IN G	TC(CELLS/CU.MM)	PLATELET COUNT	MCV IN FI	ESR MM/HR	RETICULOCYTE COUNT(%)	LDH	UREA(MG/DL)	CREATININE(MG/DL)	BILIRUBIN-TOTAL/DIRECT	SGOT/SGPT	TOTAL PROTEIN/ALBUMING LOBULIN	ALP	HIV	SERUM B12 LEVEL	ECG	CXR	USG	PS	OTHER INVESTIGATION	BM CELLULARITY	BMA	BMTB	FINAL DIAGNOSIS/PROBABLE CAUSE/COMORBID CONDITION
51	JANAKI	65	F	MIXED	NO	HT	0	0	0	1	1-MELENA	1	1	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	3	1900	12000	78	12	0.5	68	32	0.9	0.7/0.3	38/32	5.9/4/1.9	66	NEG	228	1	1	0	4	0	HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
52	ASHOK KUMAR	30	M	MIXED	NO	NO	1	1	0	0	1- MELENA	0	0	0	0	0	0	ENCEPHALPATHY	1	1	1	0	1	0	0	0	0	0	8	3250	20000	82	87	1.6	106	79	2	3.8/23	400/396	6.4/4/3	108	negative	253	0	0	4	8	MP CARD TEST-P.FALCIPARUM+	-	-	-	SEVERE FALCIPARUM MALARIA
53	KRISHNASAMY	35	M	MIXED	YES	NO	0	1	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	1	0	3.3	2950	43200	108	28	1.2	160	40	0.8	1/0.6	66/56	6.2/3.1/3.1	160	NEG	109	1	1	1	2	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/CARDIAC FAILURE
54	RAJA	36	M	MIXED	YES	NO	0	1	0	1	1-MELENA	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	3.9	3500	42000	103	29	2.2	1030	38	0.8	3.3/1.1	55/58	6.2/3.2/3	109	NEG	78	0	0	1	2		HYPERCELLULAR	2	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/HEMOLYTIC ANAEMIA
55	SANTHARAM	20	M	VEG	NO	NO	0	0	0	1	1-GUM BLEED	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	7.2	2910	16500	115	12	0.6	96	18	0.3	0.9/0.5	29/30	6.4/4/2.4	58	NEG	116	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
56	RANI	23	F	VEG	NO	NO	0	0	0	1	1-MENORRHAGIA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	7.6	2960	17900	116	18	0.4	78	20	0.2	0.6/0.4	26/18	6.3/4/2.3	71	NEG	138	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
57	KUPPUSAMY	30	M	MIXED	YES	NO	0	0	0	1	1-MELENA	1	0	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0	4.3	3100	46900	107	38	2.6	896	40	0.9	3.1/1.1	66/70	6.5/3.5/3	132	NEG	62	0	0	1	2		HYPERCELLULAR	2	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/HEMOLYTIC ANAEMIA
58	VAASU	48	M	MIXED	YES	NO	0	1	1	1	1-HEMETEMESIS	1	0	1	1	0	1	0	1	0	1	0	1	0	0	0	0	1	0	6.3	2700	44600	107	20	1.1	160	44	1	5.5/3.1/2.4	298/122	5/2.3/2.7	100	negative	202	0	0	5	2	OGD SCOPY-PORTAL HT GASTROPATHY,FUNDAL VARICES	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
59	MUNIYANDI	42	M	MIXED	YES	NO	0	0	1	1	1-MELENA	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	1	0	7	2950	52900	104	32	0.9	151	40	1.1	3.9/2.5/1.4	320/102	5.5/2.5/3	192	negative	198	0	0	5	2	OGD SCOPY-ESOPHAGEAL VARICES	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
60	PALANIYAPPAN	65	M	MIXED	YES	HT	0	0	0	1	1-EPISTAXIS	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	2	2800	11000	77	20	0.3	130	42	1	0.7/0.6	30/22	6.2/3.9/2.3	90	negative	312	1	1	0	4		HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
61	ASHA	26	F	MIXED	NO	NO	1	0	0	1	1-GUM BLEED	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	ALOPECIA+ /ORAL ULCERS+	8.9	3600	38900	81	62	0.6	128	39	1	0.8/0.2	45/40	6.1/3.1/3	92	NEGATIVE	283	0	0	0	0	ANA- POSITIVE, ANTI-dsDNA-POSITIVE	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
62	KARUPPASAMY	33	M	MIXED	YES	NO	0	1	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	6.9	3700	86000	118	40	0.9	163	40	0.9	1.1/0.5	69/53	6.3/3.2/3.1	166	NEG	172	1	1	1	2	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/CARDIAC FAILURE
63	NARAYANASAMY	65	M	MIXED	NO	NO	1	0	0	1	1-GUM BLEED	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	4	1760	8000	85	22	0.3	122	39	1.1	0.5/0.3	40/25	6.9/4/2.9	40	negative	222	0	0	0	1		HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
64	ALAMELU	65	F	MIXED	NO	HT	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6	3900	66000	112	50	0.8	142	44	0.9	1.2/0.6	48/40	6.2/3.2/3	100	NEG	166	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME
65	NISHA	32	F	MIXED	NO	NO	1	0	0	1	1-HEMOPTYSIS	1	1	0	1	0	0	PRODUCTIVE COUGH	1	0	0	0	0	1	0	0	0	0	0	5.8	3900	44300	80	72	0.6	62	23	0.9	0.6/0.3	22/26	6.8/4/2.8	69	NEG	102	0	3	0	2	SPUTUM AFB-POSITIVE	-	-	-	DISSEMINATED TB
66	HARI	39	M	MIXED	YES	NO	1	0	0	1	1-GUM BLEED	1	1	0	0	0	0	DIARRHOEA	1	0	0	0	0	1	0	0	0	ORAL LESION +	6.5	1350	25500	104	100	1	142	36	1	1-0.6	58/42	5.2/3.2/3	101	**POSITIVE**	194	0	5	0	2	CD4 COUNT - 298	-	-	-	HIV DISEASE
67	AMMASI	64	F	MIXED	NO	HT	0	0	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	1	0	0	3	2100	12500	80	12	0.5	65	40	0.9	1/0.7	22/20	5.8/3.2/2.2	65	NEG	230	1	1	0	4	0	HYPOCELLULAR	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
68	YASODA	32	F	VEG	NO	NO	0	0	0	1	1-MENORRHAGIA	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	7.8	3550	19300	115	18	0.6	0.4	28	0.5	0.7/0.4	30/24	6.5/3.5/3	69	NEG	100	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
69	JASHWAND KUMAR	36	M	MIXED	YES	NO	0	1	0	1	1-MELENA	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	5.9	2960	36000	112	28	0.9	90	42	0.8	1.2/0.5	44/35	6.6/3.6/3	152	NEG	190	0	0	1	3	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
70	RANJINI	23	F	VEG	NO	NO	0	0	0	1	1-GUM BLEED	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	7.2	3000	22500	108	16	0.4	75	29	0.7	0.7/0.4	30/22	6.9/3.9/3	60	NEG	98	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
71	KANDASAMY	65	M	MIXED	YES	HT	0	0	0	1	1-EPISTAXIS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	3.6	3400	22000	81	36	0.6	98	36	0.9	0.8/0.4	38/30	6/3.4/2.6	66	NEG	212	1	1	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA
72	PARTHIBAN	36	M	MIXED	YES	NO	0	1	0	1	1-HEMETEMESIS	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	5.6	3850	44500	110	36	1.1	90	40	1	1/0.4	48/38	6.4/3.6/2.8	122	NEG	140	0	0	1	3	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
73	SARANYA	32	F	MIXED	NO	NO	0	0	0	1	1-MENORRHAGIA	1	1	0	1	0	0	0	1	1	0	0	0	0	0	0	0	0	ORAL ULCERS+	8.9	3760	22100	83	70	0.6	106	38	0.7	1.1/0.6	120/156	6/3.2/2.8	78	NEG	258	0	0	1	1	ANA- POSITIVE, ANTI-dsDNA-POSITIVE	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
74	RANJITH KUMAR	28	M	MIXED	YES	NO	1	1	0	1	1-GUM BLEED,MELENA	1	1	0	1	0	0	DIARRHOEA+/ DRY COUGH	1	0	0	0	0	1	1	0	0	0	ORAL ULCERS+	6.8	2890	12000	115	88	0.6	106	40	1	0.9/0.4	49/40	5/3.5/1.5	87	**POSITIVE**	**109**	0	5	6	3	CD4 COUNT-196	-	-	-	HIV DISEASE
75	MADASAMY	42	M	MIXED	YES	NO	0	1	0	1	0	0	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	1	0	3.6	3800	42000	110	22	1.1	169	43	0.9	1.1/0.5	56/53	6.2/3.1/3.1	165	NEG	166	1	1	1	2	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)/CARDIAC FAILURE

S.NO.	NAME	AGE	SEX	DIET	ALCOHOLISM	COMORBIDITIES	FEVER	ABD.PAIN	ABD. DISTENSION	FATIGUE	BLEEDING MANIFESTATIONS	ANOREXIA	WEIGHT LOSS	ABD. MASS	DYSPNOEA	CHEST PAIN/PALPITATION	OEDEMA/LEG SWELLING	OTHERS	PALLOR	HEPATOMEGALY ONLY	SPLEENOMEGALY ONLY	BOTH	JAUNDICE	CLUBBING	LYMPHADENOPATHY	BONY TENDERNESS	CARDIAC FAILURE	ASCITES	OTHERS	HB IN G	TC(CELLS/CU.MM)	PLATELET COUNT	MCV IN FI	ESR MM/HR	RETICULOCYTE COUNT(%)	LDH	UREA(MG/DL)	CREATININE(MG/DL)	BILIRUBIN-TOTAL/DIRECT	SGOT/SGPT	TOTAL PROTEIN/ALBUMING LOBULIN	ALP	HIV	SERUM B12 LEVEL	ECG	CXR	USG	PS	OTHER INVESTIGATION	BM CELLULARITY	BMA	BMTB	FINAL DIAGNOSIS/PROBABLE CAUSE/COMORBID CONDITION
76	KANNIYAMMAL	64	F	MIXED	NO	NO	1	0	0	1	1-GUM BLEED	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2.6	1500	16000	78	40	0.4	79	40	1	1/0.5	22/20	5.9/3.9/2	72	NEG	315	0	0	0	1	0	hypocellular	4	1	APLASTIC ANAEMIA
77	MANOANANTH	32	M	MIXED	NO	IBD	1	1	0	1	0	1	1	0	0	0	0	CHRONIC DIARRHOEA	1	0	0	0	0	0	0	0	0	0	0	7	3000	82000	113	78	0.6	85	28	0.6	0.6/0.3	26/23	6.6/4/2.6	46	negative	79-VERY LOW	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(MALABSORPTION SYNDROME)
78	KAASI	49	M	MIXED	YES	NO	0	0	1	1	1-HEMETEMESIS	1	0	1	1	0	1	0	1	0	1	0	1	0	0	0	0	1	0	5.9	3800	48520	109	22	1	163	42	1.1	4.1/2.3	448/221	5.1/2.1/3	190	negative	450	0	0	5	2	OGD SCOPY-PORTAL HT GASTROPATHY	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
79	SIVARAJAN	65	M	MIXED	NO	NO	1	0	0	1	1-MELENA	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2.6	2900	44500	108	42	0	166	39	0.9	1.2/0.5	46/40	6.2/3.2/3	77	NEG	109	0	0	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME
80	KUPPAN	64	M	MIXED	NO	HT	0	0	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	3.9	3600	66000	102	38	1	200	40	1	1/0.3	38/30	6.1/3.9/2.2	10	NEG	169	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE
81	LAKSHMI	44	F	MIXED	NO	NO	1	0	0	1	0	1	1	0	1	0	0	DRY COUGH	1	0	0	0	0	1	0	0	0	0	0	6.9	2960	84000	86	88	0.9	102	36	0.8	1/0.5	29/28	6.7/4/2.7	78	negative	236	0	4	0	4	SPUTUM AFB-NEGATIVE	hypercellular	2	-	DISSEMINATED TB
82	PATTU	64	F	MIXED	NO	NO	1	0	0	1	1-MELENA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	2.9	1200	14500	88	18	0.6	90	42	0.8	0.9/0.6	26/28	6.5/4/3.5	90	NEG	250	0	0	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA
83	KITTAN	49	M	MIXED	YES	NO	0	1	1	0	1-MELENA	1	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	1	0	7.7	3000	48000	112	30	1.1	120	44	0.9	5.5/2.5	247/110	5/2.3/2.7	96	negative	198	0	0	5	2	0	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
84	KRISHNAN	44	M	MIXED	YES	NO	0	1	1	0	1-HEMETEMESIS	1	1	0	1	0	1	0	1	0	1	0	1	0	0	0	0	1	0	5.2	3100	29500	108	28	0.8	96	40	0	5.3/2.8	295/106	5.2/2.2/3	110	negative	203	0	0	5	2	0	hypercellular	2	-	HYPERSPLEENISM/CHRONIC LIVER DISEASE(ETHANOL RELATED)-CIRRHOSIS OF LIVER/PORTAL HYPERTENSION
85	SANTHOSH KUMAR	25	M	MIXED	NO	IBD	1	1	0	1	0	1	1	0	0	0	0	CHRONIC DIARRHOEA	1	0	0	0	0	0	0	0	0	0	0	7.9	2200	68000	105	72	2.9	2500	29	0.4	2.1/0.6	48/40	6.6/3.9/2.7	102	negative	42-VERY LOW	0	0	0	3	0	hypercellular	1	-	megaloblastic anaemia(malabsorption syndrome)/HEMOLYTIC ANAEMIA
86	NIMMY	23	F	VEG	NO	NO	0	0	0	1	1-MENORRHAGIA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	7.7	3650	18200	116	20	0.6	75	26	0.8	0.6/0.4	28/20	6.4/3.4/3	72	NEG	88	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
87	RANGANATHAN	36	M	MIXED	YES	NO	0	1	0	1	1-HEMETEMESIS	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6.8	3850	49200	111	18	1.1	90	43	0.9	1.1/0.5	46/38	6.7/3.9/2.8	105	NEG	139	0	0	0	2	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
88	PRASAD	55	M	MIXED	NO	IBD	1	1	0	1	0	1	1	0	0	0	0	CHRONIC DIARRHOEA	1	0	0	0	0	0	0	0	0	0	0	6.9	2280	63000	103	68	0.9	68	39	1	1.1/0.4	52/36	6.6/4/2.6	63	negative	59-VERY LOW	0	0	0	3	0	hypercellular	1	-	megaloblastic anaemia(malabsorption syndrome)
89	SUBITH KUMAR	32	M	MIXED	YES	NO	1	1	0	1	1HEMOPTYSIS	1	1	0	1	0	0	DIARRHOEA+/ COUGH+	1	0	0	0	0	1	1	0	0	0	ORAL ULCERS+	5.7	2700	19020	111	76	0.5	112	39	0.9	0.9/0.4	44/46	5.2/3.2/2	72	**POSITIVE**	**104**	0	3	0	3	CD4 COUNT-196,SPUTUM AFB- POSITIVE	-	-	-	HIV-TB COINFECTION
90	SUBITHA	29	F	MIXED	NO	NO	1	0	0	1	1-GUM BLEED	1	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	8.2	3150	25200	88	58	0.9	73	40	0.6	0.7/0.2	186/210	6/3.2/2.8	75	NEG	223	0	0	0	1	ANA- POSITIVE, ANTI-dsDNA-POSITIVE	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
91	SRINIVAS	22	M	VEG	NO	NO	0	0	0	1	1-MELENA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6.7	3500	12600	114	24	1.1	132	20	0.4	0.6/0.4	26/24	6.2/4/2.2	78	NEG	112	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
92	NARAYANAN	65	M	MIXED	YES	HT	0	0	0	1	1-MELENA	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	3.9	3300	32000	106	48	1	132	40	1	1.1/0.6	46/26	6.5/3.5/3	72	NEG	178	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE
93	SUBASHINI	28	F	MIXED	NO	NO	1	0	0	1	1-MENORRHAGIA	1	1	0	1	0	0	0	1	1	1	0	0	0	0	0	0	0	SKIN LESIONS+	7.9	3100	18000	85	76	1	106	42	0.9	0.9/0.3	140/160	6/3.3/2.7	70	NEG	292	0	0	4	1	ANA- POSITIVE, ANTI-dsDNA-POSITIVE	hypercellular	5	-	SYSTEMIC LUPUS ERYHROMATOSIS
94	SARAVANAN	28	M	VEG	NO	NO	0	0	0	1	1-MELENA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6.1	3600	22000	108	18	0.4	112	32	0.6	1/0.5	25/26	6./4/2.8	67	NEG	152	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
95	AMSAVENI	64	F	MIXED	NO	HT	0	0	0	1	0	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	6	3800	66000	119	43	0.9	110	43	1	1.2/0.6	50/48	6.3/3.3/3	102	NEG	106	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME
96	SUMATHI	29	F	VEG	NO	NO	0	0	0	1	1-MENORRHAGIA	1	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	4.9	2600	11300	115	12	0.6	96	22	0.5	0.9/0.4	28/20	6.4/4/2.4	63	NEG	98	0	0	0	3	0	hypercellular	1	-	MEGALOBLASTIC ANAEMIA(NUTRITIONAL)
97	SHANTHI	64	F	MIXED	NO	HT	0	0	0	1	0	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	2.9	2630	65400	112	40	1.1	132	36	0.9	1.1/0.6	39/32	6.1/3.9/2.2	72	NEG	102	1	1	0	2	0	hypercellular	3	-	MYELODYSPLASTIC SYNDROME/ANAEMIA WITH CARDIAC FAILURE
98	RAMASAMY	38	M	MIXED	YES	NO	0	1	0	1	1-MELENA	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	5.8	3700	47000	112	20	1	98	40	1	1.1/0.5	48/46	6.7/3.9/2.8	102	NEG	120	0	0	0	2	0	HYPERCELLULAR	1	-	MEGALOBLASTIC ANAEMIA(ALCOHOLISM)
99	PANNEERAMMAL	64	F	MIXED	NO	HT	0	0	0	1	1- GUM BLEED	1	0	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	2.5	2100	16000	80	18	0.6	124	40	0.9	0.8/0.5	44/50	6.1/4.2.1	68	NEG	264	1	1	0	4	0	hypocellular	4	1	APLASTIC ANAEMIA/CARDIAC FAILURE
100	MANGALU	65	F	MIXED	NO	DM	0	0	0	1	0	1	1	0	1	1	1	CYANOSIS +	1	0	1	0	0	0	0	1	1	0	0	8.6	1600	12000	77	126	2.6	1065	72	2.2	2.1/0.6	54/25	10.2/4/6.2	111	NEG	822	1	1	3	1	P.ELECTROPHORESIS- M BAND SEEN	hypercellular	6	0	MULTIPLE MYELOMA/RENAL FAILURE/ANAEMIA WITH CARDIAC FAILURE